TECHNOLOGY DEPT.

the OIL AND GAS JOURNAL

GETTING READY TO REPLACE DRILL-STEM?

Hughes flash-weld tool joints make more hole for your drilling dollar

Hughes Flash-Weld Tool Joints are built to last the life of your drill-stem.

Hughes Flash-Weld Tool Joints eliminate two-thirds of the threaded connection.

Hughes Flash-Weld Tool Joints eliminate time, trouble and expense of replacing worn tool joints.

In fields where abrasive wear is excessive, Hughes Flash-Weld Tool Joints can be rehard-faced at the rig location, safely and economically, using the field-tested technique developed by Hughes Tool Company.

Experienced Hughes representatives will be glad to discuss that replacement string with you at any time.

HUGHES TOOL COMPANY HOUSTON, TEXAS

World Standard of the Industry

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PRICE 50 CENTS TABLE OF CONTENTS PAGE 77 MAY 25, 1950

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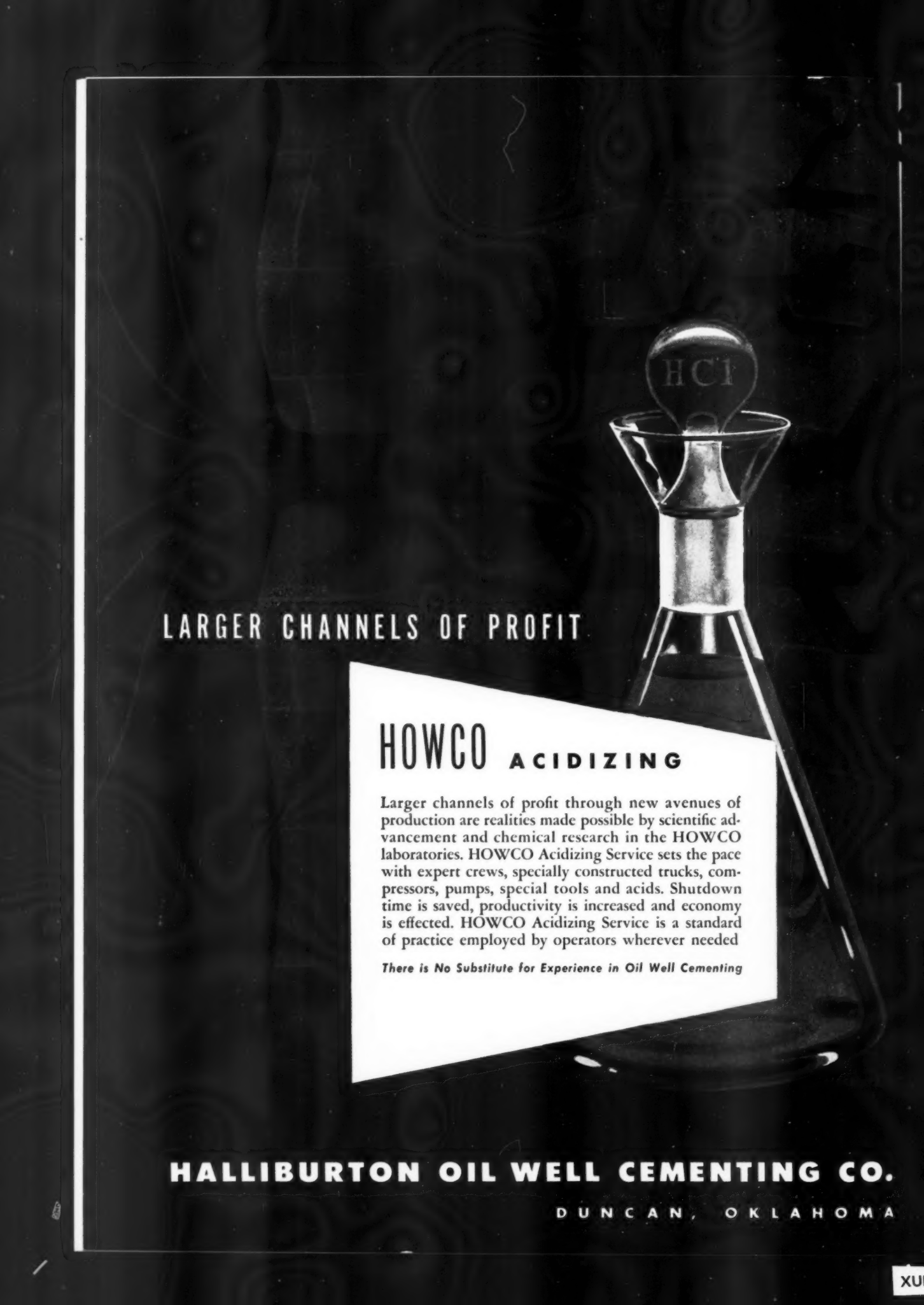


LARGER CHANNELS OF PROFIT

HOWCO ACIDIZING

Larger channels of profit through new avenues of production are realities made possible by scientific advancement and chemical research in the HOWCO laboratories. HOWCO Acidizing Service sets the pace with expert crews, specially constructed trucks, compressors, pumps, special tools and acids. Shutdown time is saved, productivity is increased and economy is effected. HOWCO Acidizing Service is a standard of practice employed by operators wherever needed

There is No Substitute for Experience in Oil Well Cementing

HALLIBURTON OIL WELL CEMENTING CO.

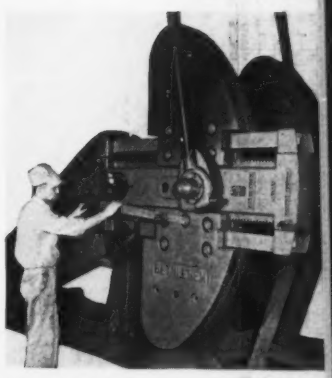
DUNCAN, OKLAHOMA

So Easy... So Safe!

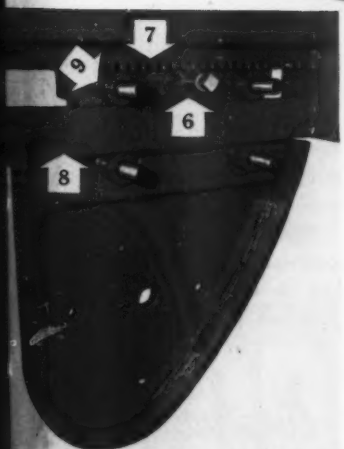
How the weights are shifted

Each of the four weight assemblies (two on each crank) consists of a heavy inner shell and a heavy outer shell (1) held together by four bolts and nuts. To change position of weights, first loosen nuts (2); then apply socket wrench to wrench square (3), turning clockwise or counterclockwise as the situation demands. This moves the entire weight assembly. Nothing to it! Numbered graduations on the crank facilitate adjustment.

If additional counterweighting is required, extra weights can be bolted inside the shells. They are held in place by bolts and nuts at points (4) and (5).



Safety! Only *one* crank position is needed for making counterweight adjustments. The operator stays on the ground... he isn't obliged to climb all over the unit. Nothing to move, nothing to slip, nothing to fall and injure him.



What happens inside?

View with outer shell removed. The wrench square (see 3, above) is part of a pinion (6) geared to a rack (7). As the pinion is turned, the weight assembly rolls smoothly along rail (8). Sturdy rollers (9) make this very easy.

For years field men have been demanding a pumping unit counterbalance that would combine simplicity with effectiveness—a system that could be adjusted EASILY, QUICKLY, and SAFELY when changes were required. Now it's here—in the Bethlehem Series 50 Pumping Units.

This Bethlehem innovation makes it possible to shift each weight in a matter of seconds, after four nuts have been loosened. A child can do it. It's foolproof, too . . . no hazards to endanger life or limb. For major details, study the three photographs shown on this page; then request a Bethlehem man to arrange a demonstration.

BETHLEHEM SUPPLY COMPANY

General Offices: 21 E. Second Street, Tulsa, Okla.

Subsidiary of Bethlehem Steel Corporation

On the Pacific Coast Bethlehem Oil-Field Equipment is sold by Bethlehem Supply Company of California

BETHLEHEM STEEL

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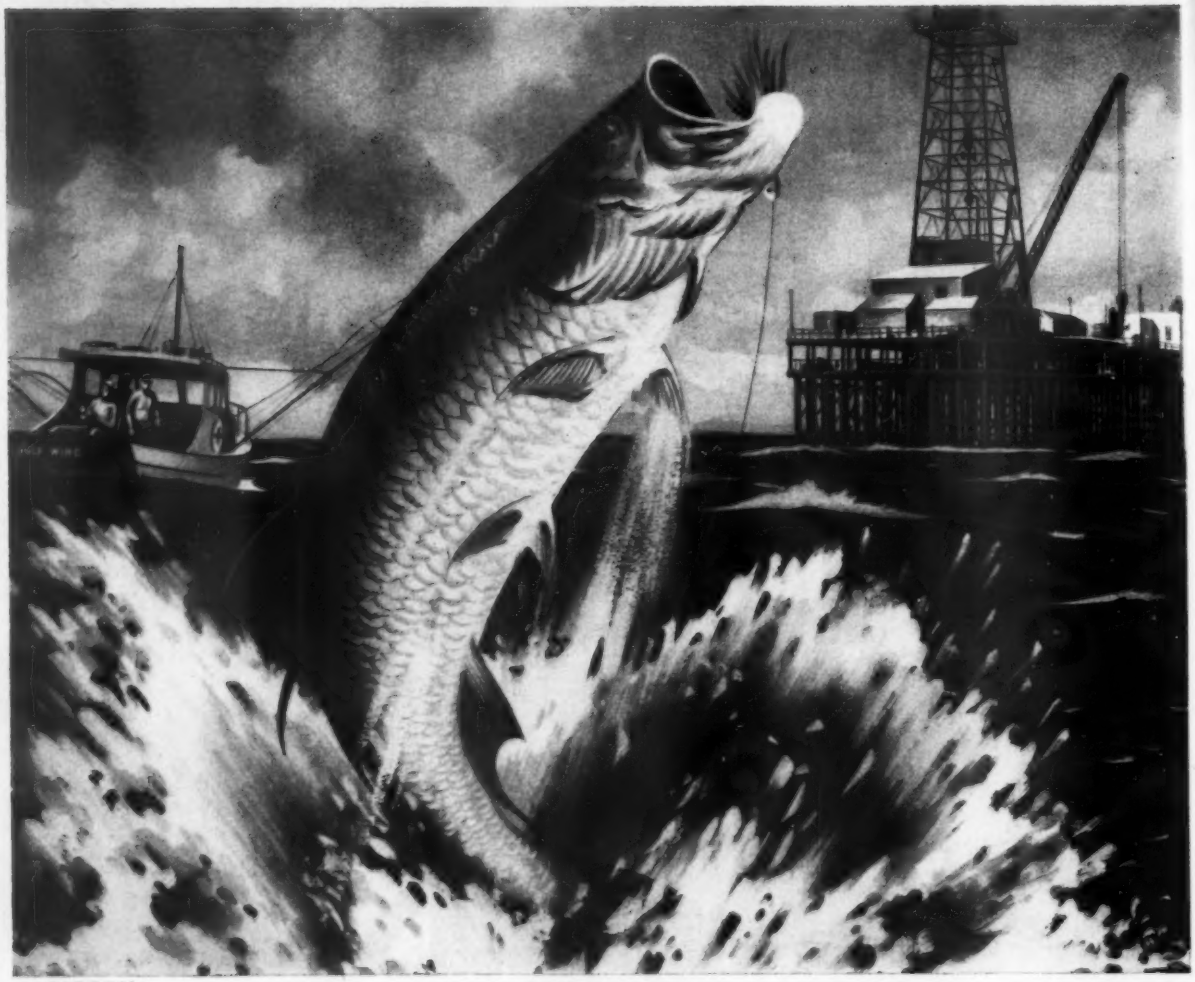

TARPON

SPECIALISTS IN *Southwest* CONSTRUCTION

Any industrial enterprise in the Southwest must cope with a variety of unique problems. The tested and proven solution to these problems is gained only through experience—***Southwest experience.***

Brown & Root, Inc., has for over thirty years successfully engineered the widest variety of industrial construction projects. During this period, "Brown-Bilt" projects have achieved an enviable record for promptness and efficiency. Such punctuality is the result of forthright, earnest endeavor on the part of Brown & Root's entire staff of highly competent, loyal personnel.

The experience gained by the Southwest's foremost engineering and construction firm would be of tangible benefit to ***any*** industrialist with Southwestern plans.

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BROWN & ROOT, Inc. *Engineers & Constructors*

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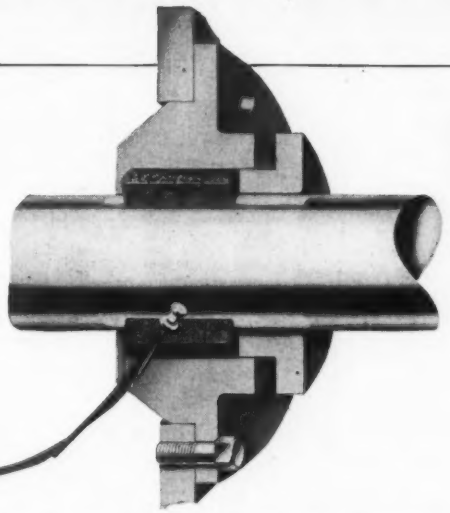
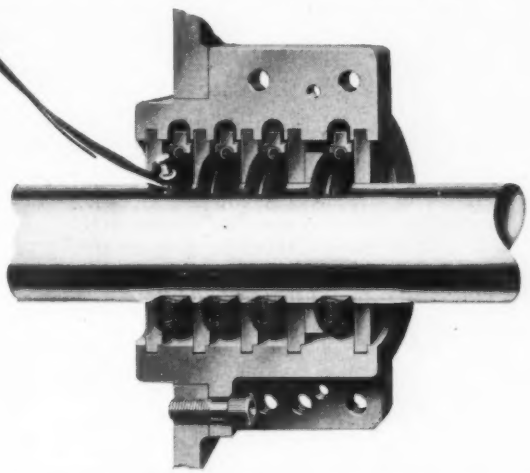
COPPUS TURBINES

offer you a choice of packing rings



STANDARD METALLIC RING PACKING — Made of high grade asbestos cores encased in specially treated lubricated aluminum foil. Recommended as a low-friction, long-service packing for steam temperatures up to 850 F and back pressures up to 50 lb. Adjustable packing glands keep leakage at minimum. Easy access to packing rings.



OPTIONAL CARBON RING PACKING — Consists of three carbon packing rings on the pressure side and one beyond the leak-off section. Each ring has three segments held together by a stainless steel garter spring. For back pressures up to 75 lb. Standard for vacuum or gas operation, or when leak-off is desired.

Heavy chrome plating on shaft at stuffing box is common to both types of Coppus packing.

Coppus Turbines ranging from 150 hp down to fractional in 6 frame sizes

FIT TURBINE COSTS TO HORSEPOWER NEEDS

When you buy turbines rated close to your exact horsepower needs, you save plenty of money. That's because turbines are generally priced in proportion to their size. The wide range of sizes of Coppus Turbines promises purchasing economy for you from the 150 hp size down to the smallest. As for operating and maintenance economies, you get them, too, from such other features as: greater number of manually operated valves for individual control of steam nozzles; replaceable cartridge-type bearing housings and others. For complete details . . .

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COPPUS ENGINEERING CORPORATION
266 Park Avenue
Worcester 2, Mass.
Sales offices in THOMAS' REGISTER

COPPUS "BLUE RIBBON" TURBINES

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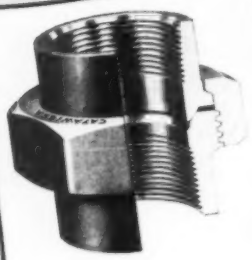
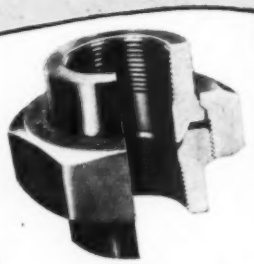
Catawissa Unions and Check Valves...

for greater operating efficiency and economy in every oil-field service



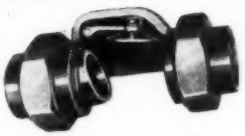
CATAWISSA NO. S-1A

The hot-forged steel union with heavy, coarse ACME threads in the union nut for quick make-up or disconnecting in the field.



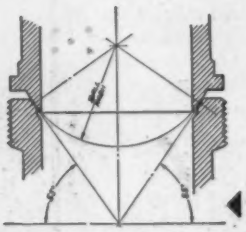
CATAWISSA NO. S-1

Hot-forged steel unions with U. S. Standard V-Threads in the union nut are recommended for general oil-field service.



CATAWISSA NO. 502 CHECK VALVE

Accessible, efficient, economical, Catawissa Double Union Swing Check Valves are full opening and are furnished with union connections on both ends, eliminating the union and nipple necessary to install the regular type check valve. They are the flow-line type designed for use where no stop is installed close to the check valve.



BALL-TO-ANGLE SEAT

CATAWISSA NO. L-1A

This union is furnished with a 2-lug nut which can be applied with either a hammer or wrench. The triangular shape eliminates distortion or breaking. Designed with coarse ACME threads for general service on drilling rigs and all piping purposes where quick make-up is desirable. Available in standard and double extra heavy weight. Sizes 1" to 3" inclusive.

CATAWISSA NO. L 1-4A

Made in 4-inch size with four lugs on the nut.

"OILWELL" store and warehouse points are stocked with a complete line of Catawissa forged-steel unions and check valves. These Catawissa products are designed and recommended for the rough-and-ready demands of any oil country application.

NOTE THESE IMPORTANT FEATURES

HOT-FORGED . . . from solid, rectangular steel bars, Catawissa Unions are free from sand and blow holes. They will expand and contract with the pipe, assuring tight joints.

THREADS . . . Catawissa Unions and Valves are supplied with either FULL ACME Threads or U. S. Standard V-Threads in the union nuts and on the female end.

SEATS . . . in all Catawissa Unions are a 55° angle on the female end to a Ball on the male end, assuring a perfect seal even when the pipe is not perfectly aligned. Carefully hand-ground seats which require no packing are inspected and tested under water to assure holding qualities.

Contact your nearest "Oilwell" representative to assist you with all your oil-field problems

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USS "OILWELL"

UNITED STATES STEEL

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Round up more temperatures in less space and time—

. . . with a

multipoint SPEEDOMAX INDICATOR

MORE than twice as many unit temperatures can be checked with a *single* Speedomax Indicator as with any other one, self-contained standard instrument available today. Reason is unique design which lets one instrument case hold both Indicator and all connections from as many as 126 thermocouples. Thus, an operator can check all unit temperatures without reaching for out-of-the-way switch boxes . . . without moving a foot. Such convenience is ideal for routine logging. And in emergency, when many more couples must be checked with least delay, this type of Speedomax can become vital.

Speedomax is fast as well as convenient. Its drum-mounted scale spins from lowest to highest temperature in 4 seconds; for smaller jumps, proportionately faster. This standard speed can be cut to 2 seconds if desired.

Key type switches—relied upon for years in refineries—are employed for their dependable service. Push-button or rotary switches can also be supplied, but accommodate fewer thermocouples per instrument.

Some refineries also use another Speedomax model which not only indicates, but can be switched to automatic signalling or recording. It fans through 20 to 160 thermocouples at only 4 seconds apiece.

If you have an application in mind, an L&N field engineer will call, or send catalog, as you prefer. Just write Leeds & Northrup Co., 4959 Stenton Ave., Phila. 44, Pa.

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

LEEDS & NORTHRUP CO.

Jrl. Ad ND46-33A-700(1)

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KEEPING MUD ON THE MOVE TO YOU

MAGCOBAR MAINTAINS STOCKPILES OF DRILLING MUD MATERIALS RIGHT AT YOUR RIG'S BACK DOOR

In many cases, the mud weighting materials and chemicals oil operators use to transform emergencies into routine operations would be of no value if they were more than an hour away from the drilling location.

Magcobar has successfully met this challenge for efficient service by establishing a network of more than 250 dealers from Canada to the Gulf Coast. Each of these friendly Magcobar dealers maintains a stockpile of mud weighting materials and chemicals, more often than not right at your rig's back door! This on-the-spot-service . . . representing an investment of hundreds of thousands of dollars by Magcobar . . . pays off by saving operators millions of dollars a year in rig time and by preventing troubles that might be caused by delays in mud or chemical deliveries.

The next time you need mud, look for the dealer who stocks Magcobar. He is doing his dead level best, night and day, to keep mud on the move to you! You can depend on him to handle your mud requirements promptly and at fair and reasonable prices.

MAGNET COVE BARIUM CORPORATION
MALVERN, ARKANSAS HOUSTON, TEXAS

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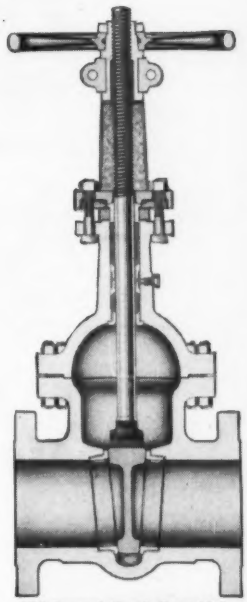
LOOK FOR THIS SIGN WHEN YOU NEED MUD

MAGCOBAR ● MAGCOGEL ● HIGH YIELD DRILLING MUD ● XACT CLAY ● FIBER-SEAL ● MAGCO-MICA ● TANNATHIN ● JEL-OIL MUD ● JEL-OIL "E" ● SALT GEL ● NOHEEV ● SEAL FLAKES ● MY-LO-JEL ● CHEMICALS

Magcobar
Complete
DRILLING MUD SERVICE
DEALER

Why shop around for piping materials?

CRANE has everything you need



300-Pound Steel Gate Valve furnished trimmed for oil and oil vapor up to 1100° F.; or steam or water up to 1000° F. Sizes 1½ to 24-inch.

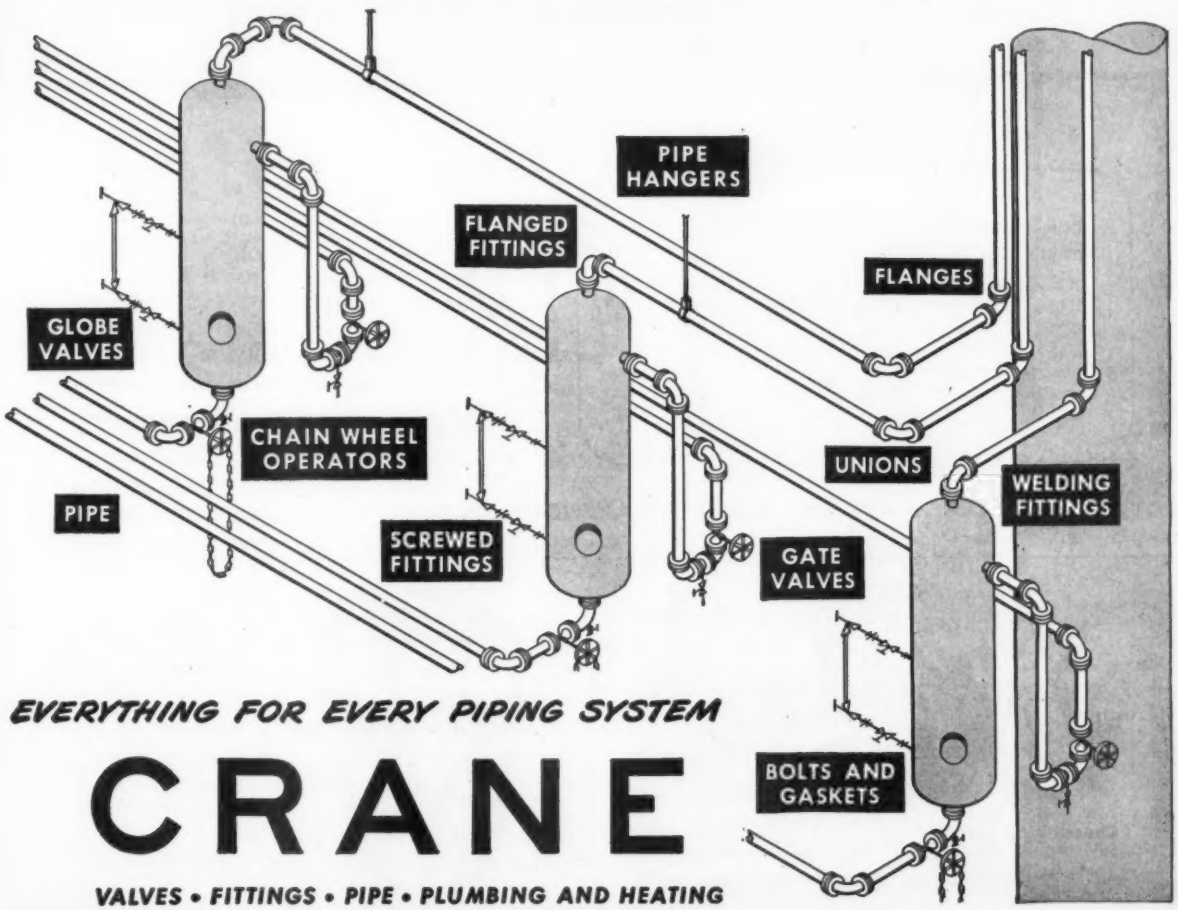
FOR DEPENDABLE SERVICE . . . EASY OPERATION

You can always rely on sturdy Crane Cast Steel Gate Valves. Tight closure is assured by long, close fitting guides that seat the solid wedge disc accurately against screwed-in body seat rings. This guiding action minimizes disc drag, reduces wear on seating surfaces. Minimum resistance to flow is assured by straight-through ports.

Crane design eliminates the possibility of stem binding . . . lengthens service life of packing. Two-piece ball-type gland equalizes pressure on packing even if gland flange is pulled up unevenly. Side strain on stem is eliminated with famous Crane flexible T-head disc-stem connection. Crane steel valves are in pressure classes from 150 to 2500 pounds, with flanged, screwed, or welding ends. See your No. 49 Crane Catalog, p. 226-32.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

THIS PROCESS PIPING HOOKUP, FOR EXAMPLE, CAN BE 100% CRANE-EQUIPPED ON ONE PURCHASE ORDER



EVERYTHING FOR EVERY PIPING SYSTEM

CRANE

VALVES • FITTINGS • PIPE • PLUMBING AND HEATING

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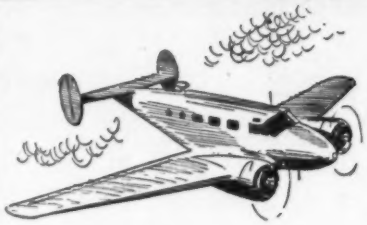
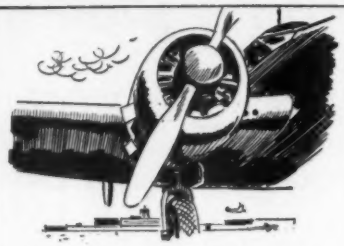


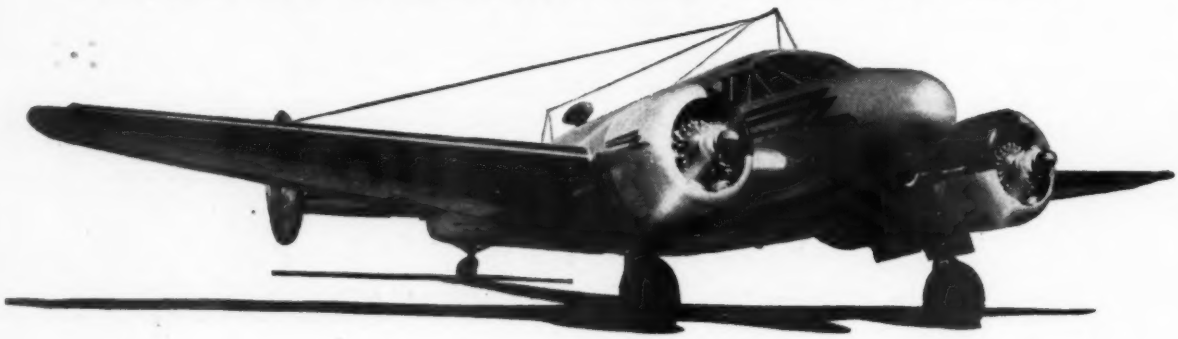
Choose it for speed and performance. With a maximum speed of 230 mph, you're in a class with the Airlines — and you have unsurpassed mobility of action, too.



Choose it for safety. Twin-engine reliability and outstanding single-engine performance provide an assurance of mental ease when flying in less favorable weather conditions.

Choose it because it has proved itself. Wartime versions rolled up hundreds of millions of miles. Today, more than 500 postwar Beech "Twins" are serving leading industries.

For the ultimate in air transportation choose the Beechcraft Executive Transport



Features place the Model D18S in a class by itself

200-mph cruising speed
Rate of climb at sea level, 1,200 feet per minute
Range up to 900 miles
20,500-foot service ceiling
Custom seating arrangement for 7, 8, or 9
Luxurious, temperature-controlled interior
Individual reading lights, ash trays, etc.

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Beechcraft
EXECUTIVE TRANSPORT

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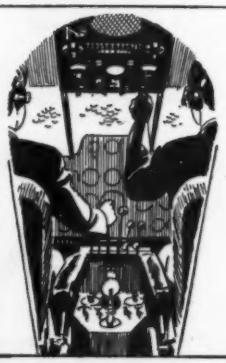

And it's the choice of pilots. Extremely efficient instrument and control layout, with major operating units conveniently located on central pedestal.

MURPHY DIESEL

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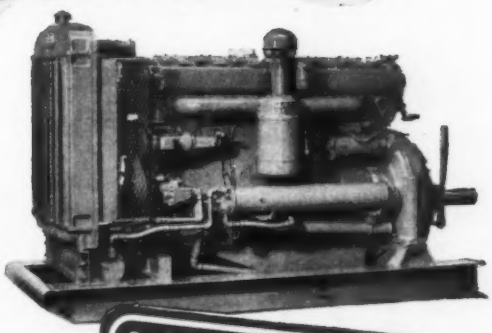

MURPHY DIESEL DEALERS, strategically and conveniently located throughout the United States, are ready to assist you. Backing these dealers are direct factory sales engineers located in the field whose sole purpose it is to aid the dealers in serving you. This complete field organization is fully qualified to help analyze and handle your complete power requirements promptly and efficiently. This is another of the many good reasons for using Murphy Diesel power.

Further, Murphy Diesel simplicity of design and rugged, heavy duty construction means—

More Power Greater Dependability
Greater Economy Longer Life

Get acquainted with your Murphy Diesel Dealer, now, and let him show you how Murphy Diesels can deliver more horsepower for fewer dollars. If you do not know your dealer's name, we'll be happy to send it to you.

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5305 W. Burnham St. Milwaukee 14, Wis.

MURPHY DIESEL

Heavy duty power
for all services

Murphy Diesel engines and power units are made in sizes from 90 to 220 H. P.; generator sets from 60 to 133 K. W.

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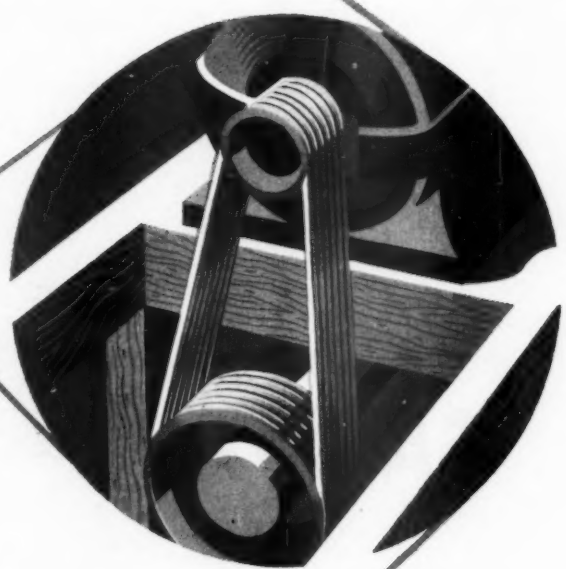
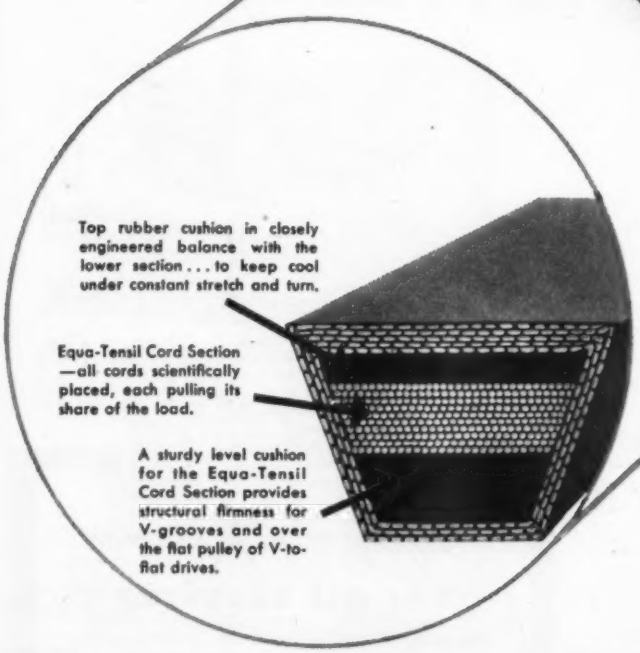
YOU CAN GET MORE OUT OF V-BELTS

There is a U. S. Rubber V-Belt specialist at the other end of your phone. He will show you how to make *every* belt in multiple assemblies pull its equal share of the load. When you have had this unique "U. S." service, every belt will run smoothly on the sheaves.

"U. S." V-Belts of every size and description are working on oil fields everywhere. They are classified to extremely close tolerances and carefully cured in precisely designed molds. Extra pulling power is gained by means of straight sidewalls, which grip the grooves for complete contact the full height of the belt. Protective jackets increase the grip while keeping out the dirt and prolonging wear.




Top rubber cushion in closely engineered balance with the lower section . . . to keep cool under constant stretch and turn.
Equa-Tensil Cord Section —all cords scientifically placed, each pulling its share of the load.
A sturdy level cushion for the Equa-Tensil Cord Section provides structural firmness for V-grooves and over the flat pulley of V-to-flat drives.

Remember that United States Rubber has what is probably the largest collection of V-Belt molds in existence. "U. S." engineers have solved such a wide variety of V-Belt problems that today, if you want a "special" in a hurry, chances are it can be obtained without making a new mold. Write to address below.

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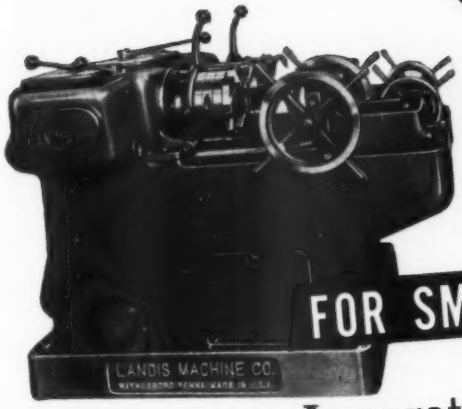
U.S.RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

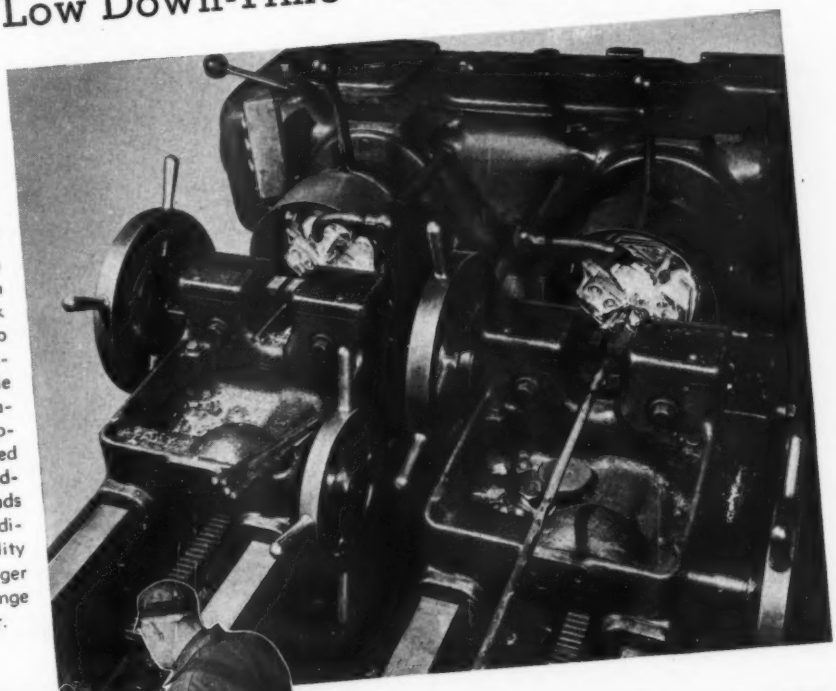


"ideal"

FOR SMALL SHOP THREADING JOBS

Accurate Threads · Easy Operation
Low Down-Time · Versatile Capacity

This 1" Landmaco Double Machine is threading 3/8" and 1/2" cold drawn steel rods for structural and ornamental steel. The 13 and 16 pitch USS threads are cut 6" long, but on similar jobs threads are cut up to 20-foot lengths. Production costs are lower than with previous methods. This installation is an example of the value of Landmaco Double Machines in job threading work. Threads can be cut to Class 4 fit, yet work completed at the rate of 40 to 45 surface feet per minute, according to diameter. Two die heads can be operated on separate jobs, with separate operators, or both heads can be fed by a single operator. This Landmaco Double will cut threads ranging from 1/4" to 1" in diameter, providing the versatility essential in any job shop. Larger Landmacos will handle a range from 3/8" to 2 1/2" diameter.



LANDIS MACHINE COMPANY

WAYNESBORO · PENNSYLVANIA

THREADING MACHINERY · THREAD CUTTING DIE HEADS · COLLAPSIBLE TAPS

Represented in the Domestic Oil Fields by: Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; C. J. Harter Machinery, Houston, Texas; Frederic-Baker Co., New Orleans, La.; Moore Machinery Co., Los Angeles and San Francisco, Calif.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

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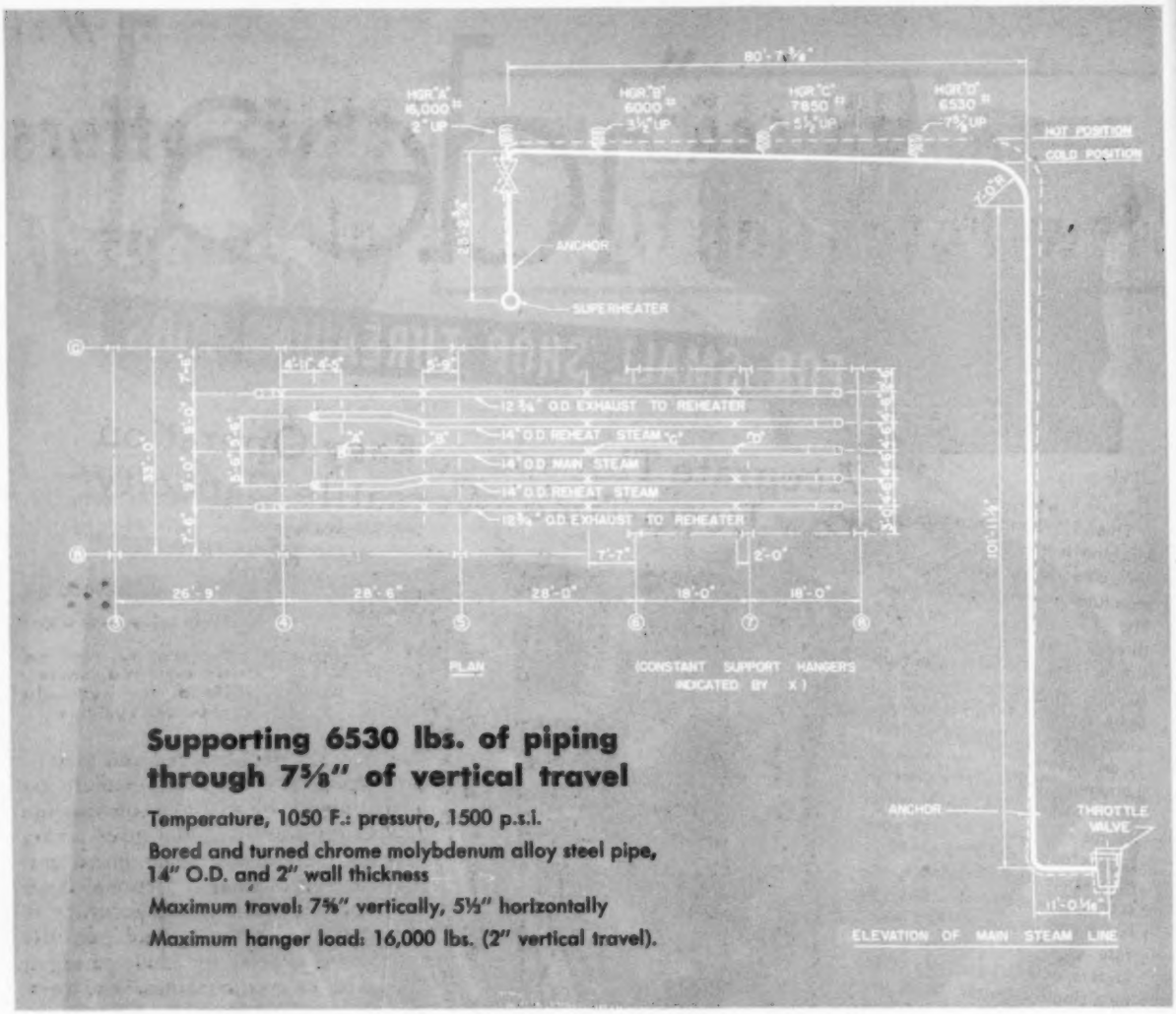

Supporting 6530 lbs. of piping through 7⅝" of vertical travel

Temperature, 1050 F.: pressure, 1500 p.s.i.

Bored and turned chrome molybdenum alloy steel pipe, 14" O.D. and 2" wall thickness

Maximum travel: 7⅝" vertically, 5½" horizontally

Maximum hanger load: 16,000 lbs. (2" vertical travel).

ONLY a Grinnell Constant-Support Hanger solves this problem easily, practically

Provides constant support to piping subject to vertical movement — in all hot and cold positions. Maintains full safety factor in supporting high temperature, high pressure piping. Non-resonant and energy absorbing. Mass-produced from standard precision parts. Individually calibrated for each installation. Load-adjustment features incorporated into design. Models to meet entire range of load-travel specifications. Minimum headroom required.

Believing that a good piping job is too important to be jeopardized by improvised or inadequate pipe hangers, Grinnell has developed a complete line of stock hangers and supports for every piping need from a simple water pipe to a high pressure, high temperature steam line. Write for Catalog 10-D.

100th ANNIVERSARY — WHEREVER PIPING IS INVOLVED

GRINNELL

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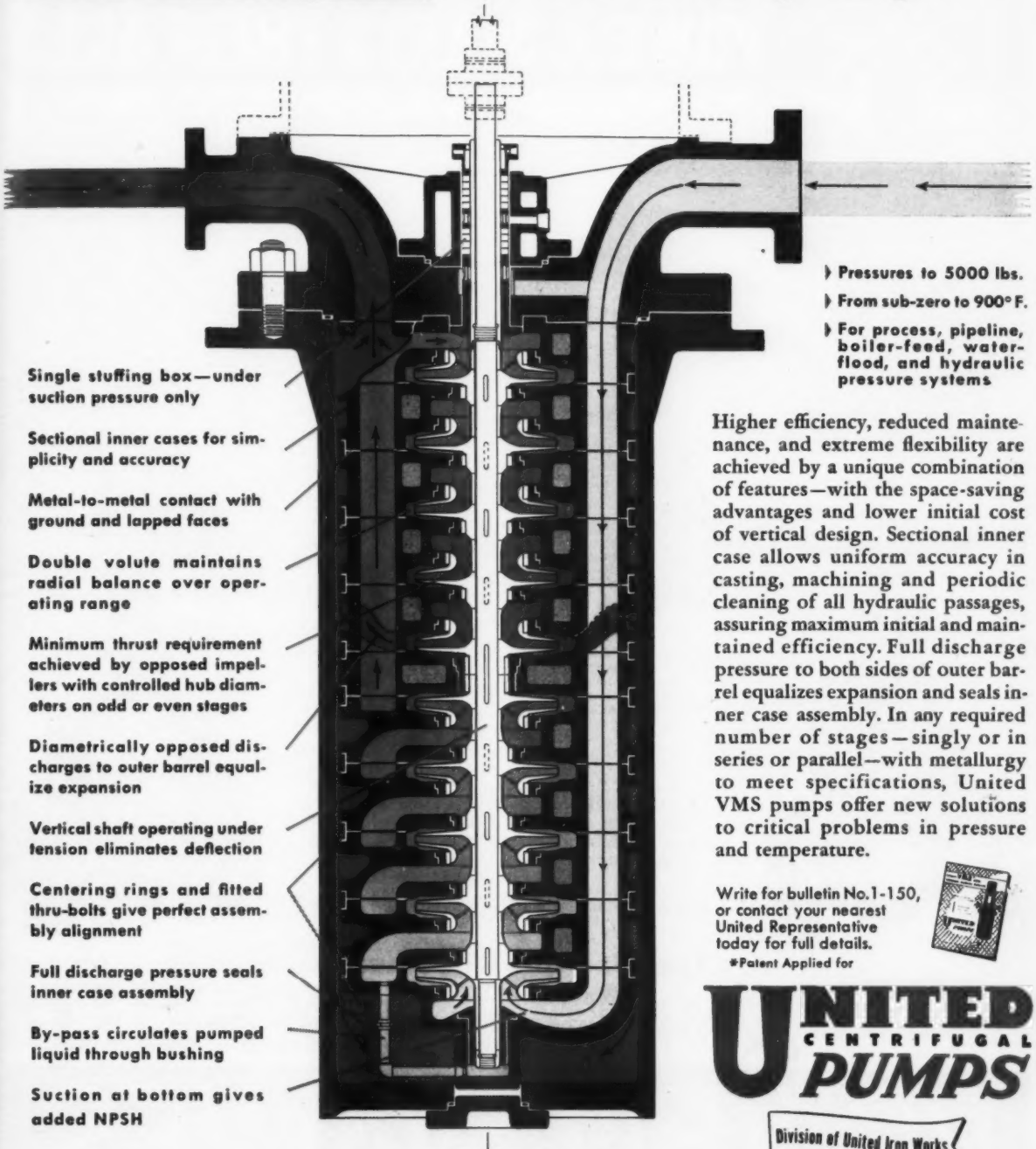
UNITED VMS* SERIES offers

New Potentials in vertical pumps



- Pressures to 5000 lbs.
- From sub-zero to 900° F.
- For process, pipeline, boiler-feed, water-flood, and hydraulic pressure systems

Single stuffing box—under suction pressure only

Sectional inner cases for simplicity and accuracy

Metal-to-metal contact with ground and lapped faces

Double volute maintains radial balance over operating range

Minimum thrust requirement achieved by opposed impellers with controlled hub diameters on odd or even stages

Diametrically opposed discharges to outer barrel equalize expansion

Vertical shaft operating under tension eliminates deflection

Centering rings and fitted thru-bolts give perfect assembly alignment

Full discharge pressure seals inner case assembly

By-pass circulates pumped liquid through bushing

Suction at bottom gives added NPSH

Higher efficiency, reduced maintenance, and extreme flexibility are achieved by a unique combination of features—with the space-saving advantages and lower initial cost of vertical design. Sectional inner case allows uniform accuracy in casting, machining and periodic cleaning of all hydraulic passages, assuring maximum initial and maintained efficiency. Full discharge pressure to both sides of outer barrel equalizes expansion and seals inner case assembly. In any required number of stages—singly or in series or parallel—with metallurgy to meet specifications, United VMS pumps offer new solutions to critical problems in pressure and temperature.

Write for bulletin No. 1-150, or contact your nearest United Representative today for full details.

*Patent Applied for

UNITED CENTRIFUGAL PUMPS

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Bronze, Iron, Steel and Corrosion-Resisting Valves-

POWELL MAKES THEM ALL!

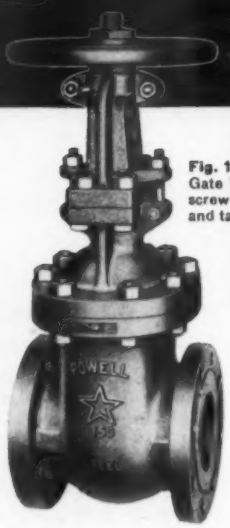

Fig. 1503—Class 150-pound Cast Steel Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke and tapered solid wedge.

When you come to ONE SOURCE, you simplify your valve buying—and stocking of spare valves and parts—for your entire flow control system.

Powell Bronze, Iron, and Steel Valves are second to none in giving long, trouble-free service. And when it comes to Special Design and Alloy Valves for Corrosion Resistance, Powell is the acknowledged leader. In fact, Powell makes the *only* COMPLETE line of these valves available to Industry today.

Fig. 1793 — Large 125-pound Iron Body Bronze Mounted Gate Valve. Flanged ends, bolted flanged yoke, outside screw rising stem and tapered solid wedge. Also available in All Iron.

Fig. 375 — 200-pound Bronze Gate Valve with screwed ends, inside screw rising stem, union bonnet and renewable wear-resisting "Powellium" nickel-bronze disc.

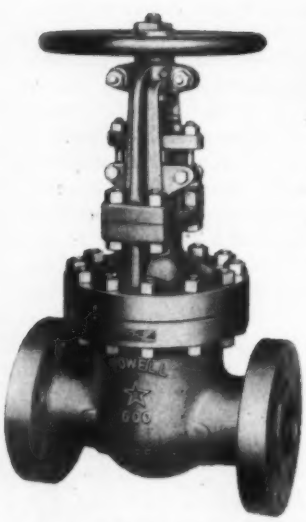

Fig. 6003—Class 600-pound Cast Steel Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke, tapered solid wedge.

The Complete Powell Line includes Globe, Angle, "Y", Gate, Check, Non-return, Relief and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-resistant metals and alloys.

Ask your nearest Distributor—or write direct

The Wm. Powell Company
Cincinnati 22, Ohio
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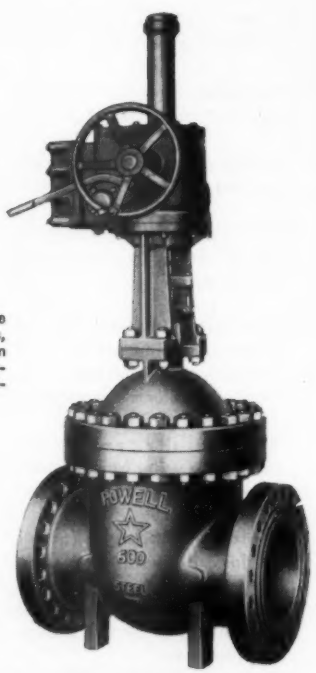
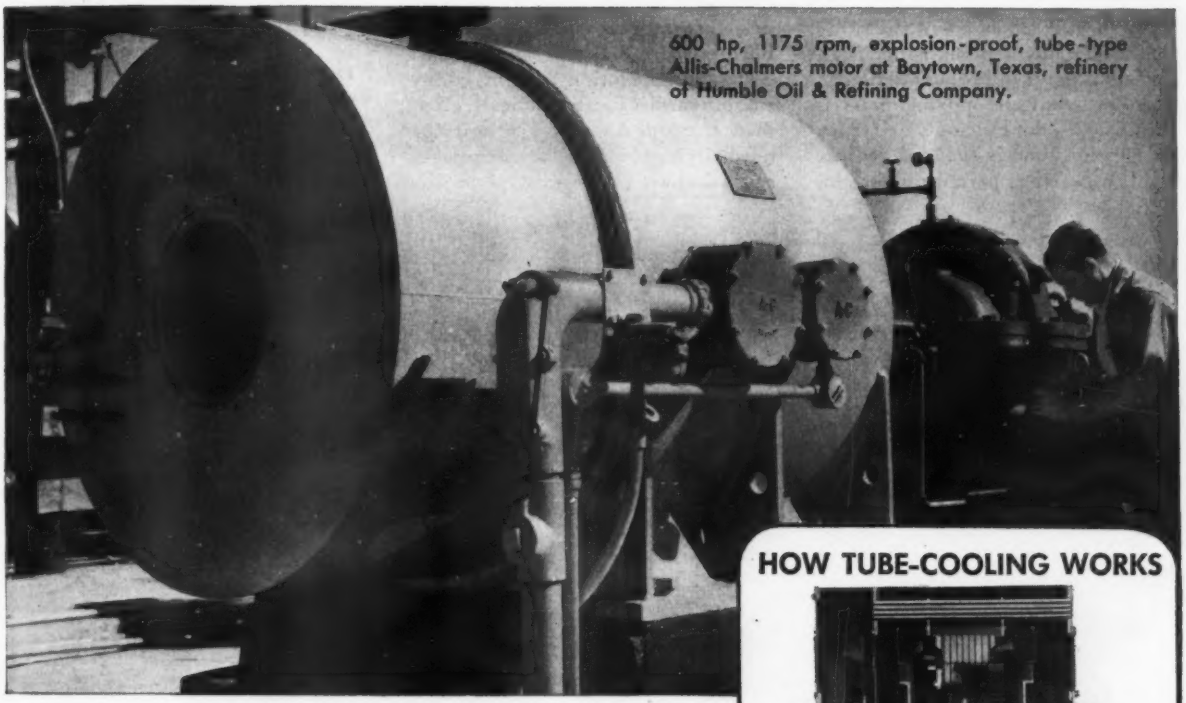


Fig. 6079 M.O.—Class 600-pound Cast Steel Gate Valve for Pipe Line Service. Has flanged ends and bolted flanged bonnet. Motor operated. Also available in Classes 150, 300, and 400 pounds.

POWELL VALVES

STRAIGHT FLOW OF AIR MAKES TUBE-TYPE TEFC* MOTORS

Self-Cleaning



600 hp, 1175 rpm, explosion-proof, tube-type Allis-Chalmers motor at Baytown, Texas, refinery of Humble Oil & Refining Company.

*TEFC MEANS—*Totally Enclosed, Fan Cooled*

YOU CAN GET THE SAME PROTECTION against explosive vapors in refinery and allied operations that Humble Oil & Refining company gets with its Allis-Chalmers tube-type motors.

This *new* type of motor is self-cleaning. Cooling air flows through straight, smooth tubes. There are no recesses to collect moisture and dirt as in conventional designs. Heat exchanger type of cooling reduces weight of the motor. The tube-type design has been adapted to the most severe corrosive conditions found in refineries or chemical plants.

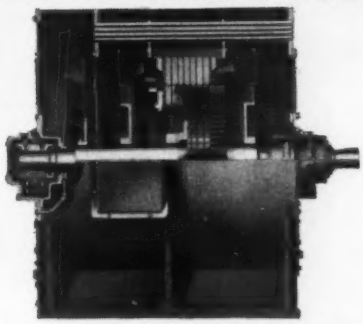
It is now available with Underwriters Laboratories' label from 125 to 800 hp, 3570 rpm, with corresponding ratings at lower speeds.

For more information, get Bulletins 51R7149 and 05B7150.

A-3028

ALLIS-CHALMERS, 1059A SO. 70 ST.
MILWAUKEE, WIS.

HOW TUBE-COOLING WORKS



1. Efficient air flow combined with large heat transfer area for quick heat removal. 2. Free from dirt and moisture collecting obstructions. 3. *Internal* fans circulate inside air for rapid heat dispersal. 4. *External* fan blows cooling air through tubes. 5. All electrical parts completely enclosed for maximum protection from dirt and corrosive atmospheres.

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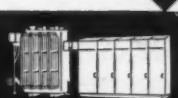
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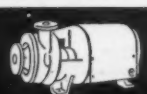
MOTORS—*TEXROPE* DRIVES-CONTROL


CENTRIFUGAL PUMPS

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More oil, less toil— with pump on TIMKEN® bearings

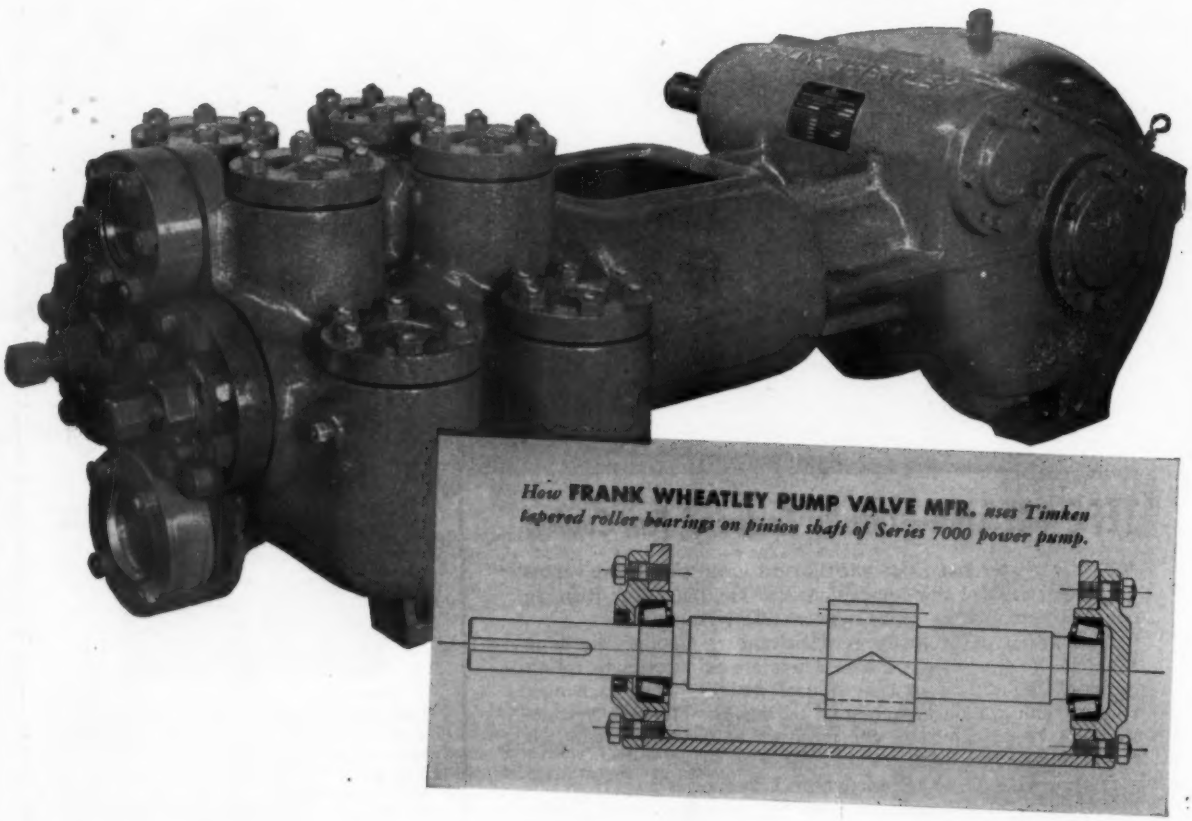
OIL keeps on the move when this Wheatley pump is on the job. Timken® bearings at vital points prevent breakdowns and insure trouble-free operation. And they save you lubrication and maintenance time, too.

Since Timken tapered roller bearings hold shafts in proper alignment, excessive wear on moving parts is eliminated. Less time-out for repair. Lubrication time is reduced because Timken bearings permit tighter closures to keep lubricants *in*—dirt and moisture *out*.

Due to the line contact between rolls and races, Timken bearings have extra load-carrying capacity. Tapered design enables them to carry any combination of radial and thrust loads. True rolling motion and incredibly smooth surface finish practically eliminate friction. And Timken bearings normally last the life of the machine because they are (1) engineered for the job, (2) made of Timken fine alloy steel, and (3) precision manufactured.

Timken bearings are a definite sales plus in any product. Insist on them in the machinery you buy; make sure they're in the machines you build. And always look for the trade-mark "Timken" on the bearings. The Timken Roller Bearing Company, Canton 6, O. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **FRANK WHEATLEY PUMP VALVE MFR.** *uses Timken tapered roller bearings on pinion shaft of Series 7000 power pump.*

FINISHED TO CLOSER TOLERANCES

Finishing to incredible smoothness accounts for much of the precise, smooth rolling performance of Timken bearings. This honing operation is typical of the amazingly accurate manufacturing methods at Timken.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

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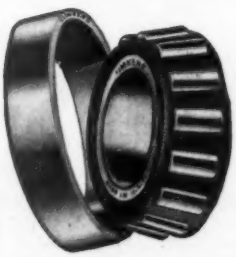
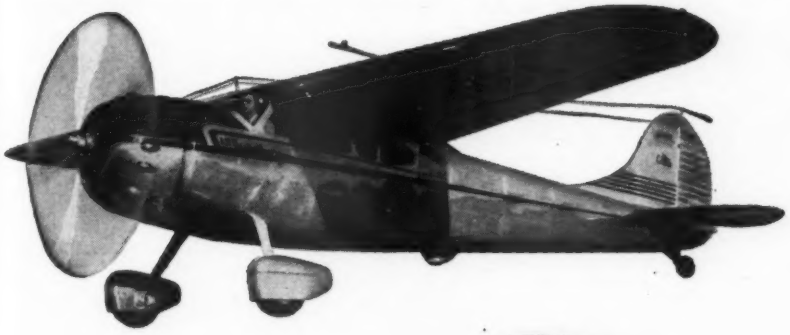
TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST →◫← LOADS OR ANY COMBINATION →✳←

★ DESIGNED TO PAY FOR THEMSELVES...AND MORE! ★



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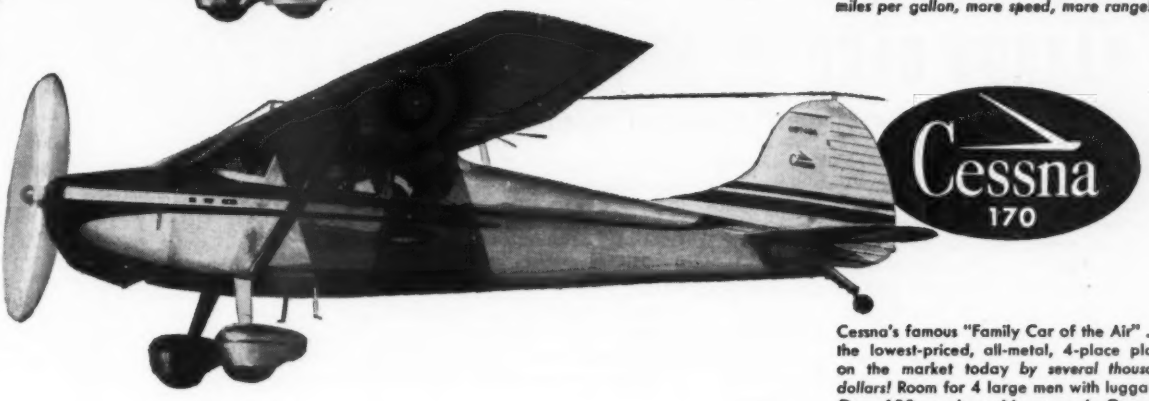
The practical personal *airliner*. All-metal, 4-5 place. Airline-type engines. Your Cessna Dealer will be glad to show you that the 190 Series Cessnas give you shorter take-off, more speed, more range, more load and more comfort. By far the roomiest, most luxurious plane in its class—yet Cessna engineering gives you *extremely low operating and maintenance costs.*

Cessna
140

The *only* low-priced, all-metal 2-place plane on the market! It offers more room, more luxury features . . . and efficiency formulas from all over the U.S.A. *prove* it delivers *more miles per gallon, more speed, more range!*



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Cessna's famous "Family Car of the Air" . . . the lowest-priced, all-metal, 4-place plane on the market today *by several thousand dollars!* Room for 4 large men with luggage. Over 120 m.p.h. cruising speed. Over 15 miles per gallon of gas.

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THERE'S ONE THAT FITS YOU...AND YOUR POCKETBOOK!

Take a good look at your business... *and yourself.* Then visit your Cessna dealer.

He's prepared to show you—with facts and figures and by practical test—that there's a Cessna which will more than pay for itself in your business and add extra pleasure to your life.

For example, on an average 1,000-mile trip in the U. S. A. the 2-place Cessna 140 will get you there within an hour of DC-3 airline schedules. And with the Cessna 170 and 190-195, you can *beat* DC-3 airline schedules!

Yet all of these fast, luxurious Cessnas are also engineered for the simplest possible maintenance, the most economical operation plus great stability and ease of flying. You'll be amazed when you see the figures.

Think what this increased mobility—this ability to go where you want, when you want, quickly *and economically* can mean to you and your business! Think of the competitive advantages it will give you.

Only Cessna can produce such values because only Cessna builds a complete line of all-metal personal planes.

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G-E 2-WAY RADIO

NARROW-BAND 25-50 MC EQUIPMENT

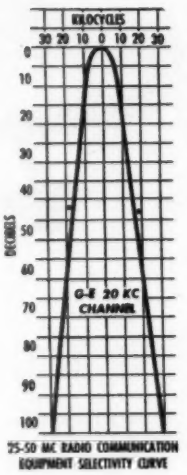
for adjacent channel operation!

● **Minimum Interference**—With adjacent channels now being assigned in the same service area, it's important to remember that G-E narrow-band units reduce interference, yet extend your communication range. They were designed specifically to meet the demand for equipment that would operate on closer spacing than 40 kc.

● **Instantaneous Modulation Limiting**—prevents "clipping" in weak signal areas, assures full utilization of your assigned channel. Limiters in the transmitter provide narrow swing of ± 6 kc deviation, and automatically hold it at this level.

● **Spurious Radiation**—is extremely low, not only in the 25-50 mc band, but throughout the frequency spectrum. Exceeds FCC requirements without external filters.

● **Peak Selectivity**—Triple-tuned transformers mean fewer tubes, lower maintenance, and total standby battery drain of less than 10 amperes. Selectivity is better than 100 db at ± 30 kc.



25-50 MC RADIO COMMUNICATION EQUIPMENT SELECTIVITY CURVE

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The problems involved in designing and producing gearing for high-speed units are quite different from those encountered in ordinary industrial transmissions. When pinions may operate at speeds as high as 9,000 RPM and pitch line velocities of gears may reach 10,000 FPM, even slight deviations from gear "perfection" result in excessive noise, vibration and premature wear.

The gears used in Farrel speed increasers are the continuous-tooth herringbone design—the famous *Gear with a Backbone*—precision generated by the Farrel-Sykes process. All gear generating equipment used in their production has been developed and manufactured by Farrel-Birmingham.

Conclusive proof that Farrel units are correctly designed and built for pipe line pumping is furnished by their service record. All of the units installed since 1932, when they were first developed as a standard series, are still in operation, performing as well as on the day they were put into service.

For full information about these time-proved speed increasers, write for your copy of Bulletin No. 448. No cost, no obligation.

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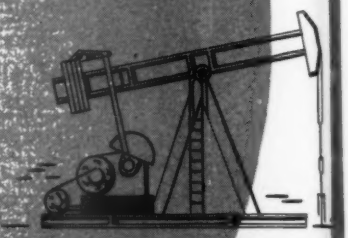

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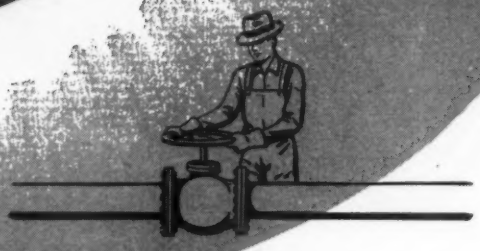

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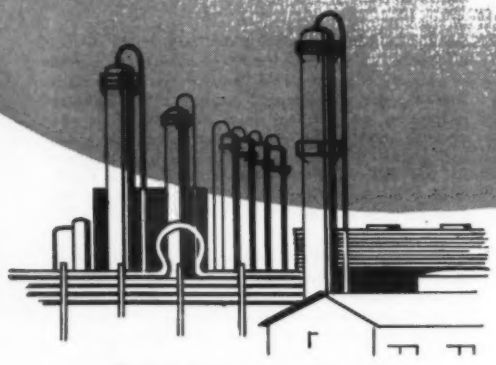

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TO BRUSH, WEED and GRASS PROBLEMS!

ESTERON
BRUSH KILLER

2-4
DOW WEED KILLER
FORMULA 40

SODIUM TCA
90%

Tests made by Dow in cooperation with many industries and public utilities over the past five years definitely show that a right-of-way substantially free from noxious weeds and woody vegetation may be maintained with Esteron Brush Killer. This powerful Dow ester formulation has proved its effectiveness as a foliage spray or when applied directly to cut stubs and stumps to prevent resprouting.

Where woody brush or brambles are not a problem, 2-4 Dow Weed Killer, Formula 40 gives effective, progressive control of weeds growing in right-of-ways and around tank farms.

NEW! *Sodium TCA 90%*
CONTROLS GRASSES

A new ally of maintenance crews is Sodium TCA 90%, a Dow herbicide now available for control of hard-to-kill grasses such as Johnson, Bermuda, quack and other perennial grasses. It also kills annual grasses such as crab grass, foxtail and chess, and promises effective control of prickly pear cactus and palmetto. If a light grass cover is desired on ditchbanks and roadsides, Sodium TCA 90% may be used at lower dosages merely to retard growth for considerable periods. Sodium TCA 90% may be combined with 2-3 Dow Weed Killer, Formula 40 for weed and grass control *at one spraying.*

See your dealer—or write to Dow for complete information.

Agricultural Chemical Division

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GRAIN AND SOIL FUMIGANTS • WOOD PRESERVATIVE

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CHEMICALS
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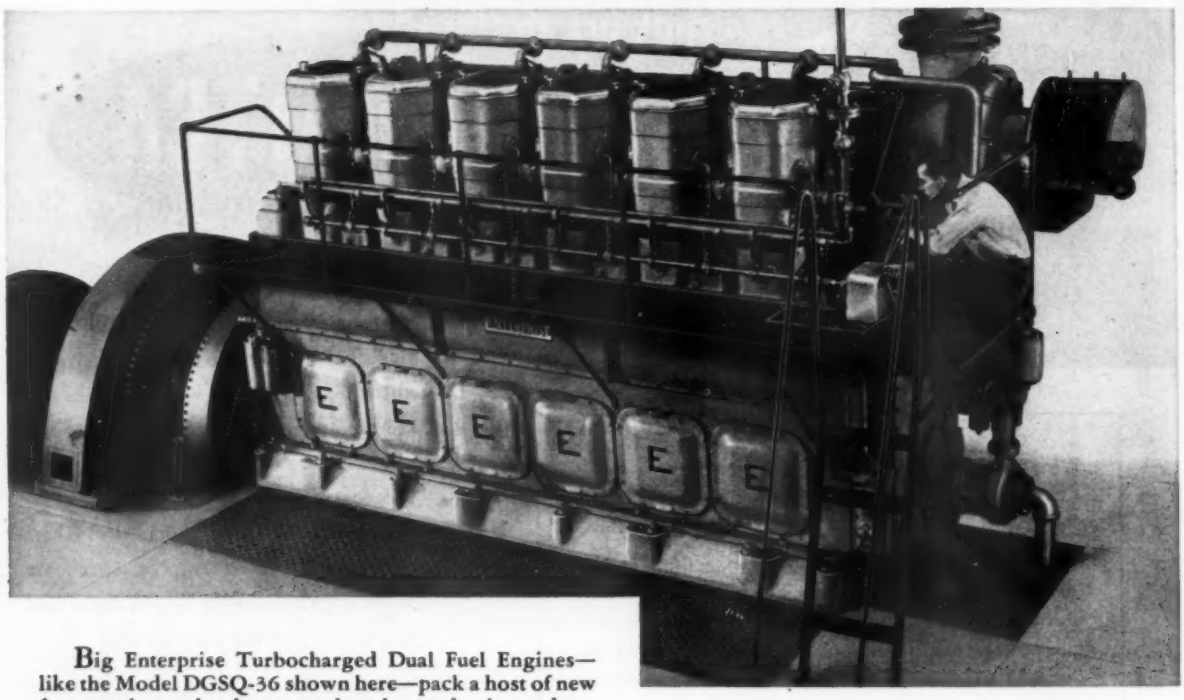
THERE'S NEW ECONOMY IN ENTERPRISE TURBOCHARGED *DUAL FUEL ENGINES*



Big Enterprise Turbocharged Dual Fuel Engines—like the Model DGSQ-36 shown here—pack a host of new features that make them your best buy today in modern, high-economy power.

Here is the engine that actually cuts operating costs as much as 50%. For in addition to the economies inherent in Enterprise straight diesel operation, this flexible engine efficiently handles a variety of gas fuels, including natural gas, butane or butane-propane mixtures, manufactured or sewage gas—whichever is available at lowest cost per BTU. The new Enterprise gas-fuel system is quickly set or changed to any mixture desired—without stopping the engine or changing parts—from full diesel operation to 95% gas, 5% pilot oil. No dangerous overloads are possible. And Enterprise Turbocharging further reduces initial engine costs per HP, plus gaining important savings in fuel.

When you compare—feature for feature—*your* choice will be Enterprise . . . the choice of power experts.

Write for new Bulletin

Bulletin No. DF-200 describes in detail the outstanding features of Enterprise Dual Fuel Engines, normally aspirated and turbocharged. Write for your copy today!

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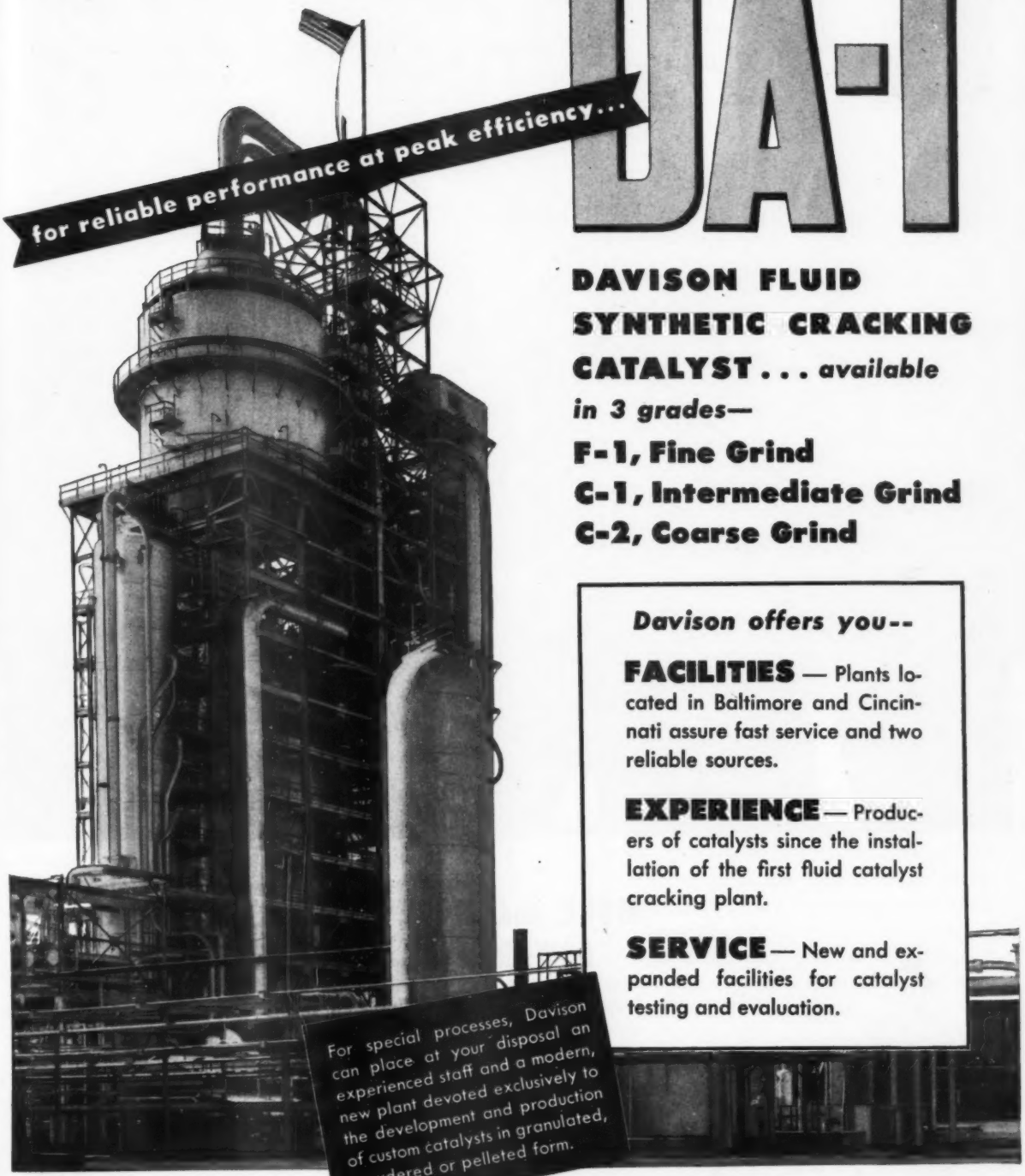
for reliable performance at peak efficiency...



DAVISON FLUID SYNTHETIC CRACKING CATALYST . . . *available in 3 grades—*

F-1, Fine Grind
C-1, Intermediate Grind
C-2, Coarse Grind

Davison offers you--

FACILITIES — Plants located in Baltimore and Cincinnati assure fast service and two reliable sources.

EXPERIENCE — Producers of catalysts since the installation of the first fluid catalyst cracking plant.

SERVICE — New and expanded facilities for catalyst testing and evaluation.

For special processes, Davison can place at your disposal an experienced staff and a modern, new plant devoted exclusively to the development and production of custom catalysts in granulated, powdered or pelleted form.

WRITE FOR INFORMATION AND SPECIFICATIONS

THE DAVISON CHEMICAL CORPORATION

Progress through Chemistry

BALTIMORE-3, MD.

ALSO PRODUCERS OF: SILICA GEL, SILICOFLUORIDES, CASTING COMPOUNDS, ALUM, INORGANIC ACIDS, FERTILIZER MATERIALS, ASPHALT COMPOUNDS

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MORE and MORE PUMP STATIONS ARE POWERED BY *LCP EVERY DAY!

Pumping oil through the 1002-mile Basin-Ozark Pipe Line System is a "snap" for me! When it comes to pipeline operation, I have an impressive record! Check costs... low installation, operating, maintenance and labor costs! Check convenience... fewer repairs, easy portability, automatic controls! Check dependability... smooth, trouble-free operation. Call the Power Engineer of your Utility Electric Power Company—he has the figures to bear out my record!

*LOW COST POWER

PETROLEUM ELECTRIC POWER ASSOCIATION

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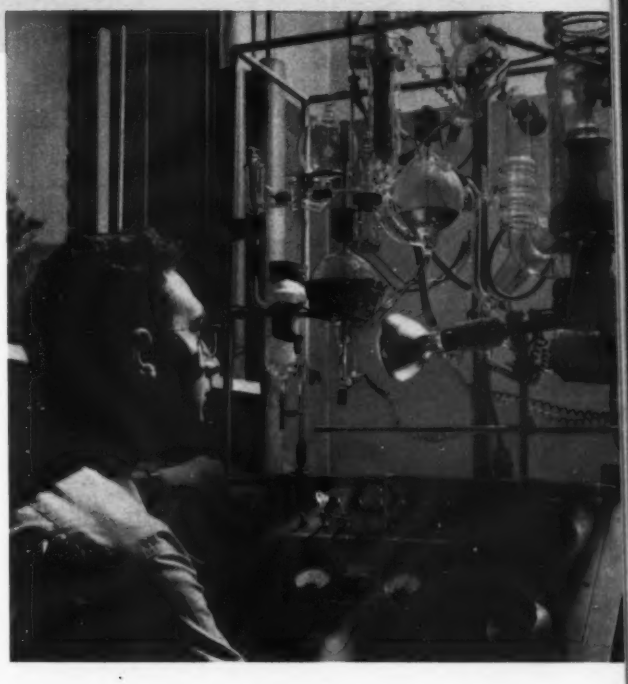
Du Pont Research { Functions In Two Ways



Research on Fuel Performance in Engines Available Today

The final measure of any fuel's performance is its behavior under actual driving conditions. That is why Du Pont maintains two road test fleets. One, a passenger car fleet, is located in the East; the other, made up of heavy duty trucks, is based at El Monte, California. To relate the findings from these operations with future developments, Du Pont also operates cars with experimental high compression engines, some of which utilize compression ratios as high as twelve to one.

Basic Long Range Research on Fuels of the Future

Just as engine design and characteristics change to give better performance, fuels likewise must be changed to meet new demands. To anticipate these changes, Du Pont is studying the basic nature of combustion, both from a physical and a chemical standpoint. The work is directed not only toward improvement of present antiknock compounds and other additives, but also toward the development of new compounds which will help refiners meet the higher performance standards of the future.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . Through Chemistry

USE DU PONT TETRAETHYL LEAD COMPOUNDS

XUM

Du Pont Research Reports are Available on Request

An Up-To-Date Informative Program . . .

The results of Du Pont research on fuels, fuel utilization, and fuel blending problems are available to all refiners. Some of these findings are in the form of published papers. Other information which may apply directly to problems that confront you can be obtained from Du Pont Sales or Technical Representatives.

Organized Attack on Industry-Wide Problems . . .

Many problems, such as sulfur-tetraethyl lead interaction in motor fuels, are common throughout the industry. Du Pont is aware of such problems and has launched a concerted attack upon them through all phases of research. In many instances this involves physical and chemical studies of fuels and combustion processes.

Facilities to Work on Your Problems . . .

The center of Du Pont Petroleum Chemicals Research is located at Deepwater, N. J. Here extensive facilities exist for research on problems involving fuels, their components, or their use in internal combustion engines. In addition to these studies, requirements for the future are constantly being explored in the Company's Wilmington Experimental Station, for which a new $30,000,000 expansion project is nearing completion.

Material on TEL and Additives

. . . A number of papers recording the results of Du Pont Research on various problems have already been published. Among these, the following may be obtained through your Du Pont Representative or the nearest Du Pont District Office:

- **Sulfur-Tetraethyl Lead Interaction in Motor Fuels** —*By* H. K. LIVINGSTON
- **Effect of Sulfur on Combustion of Leaded Gasoline** —*By* H. K. LIVINGSTON, J. L. HYDE, M. H. CAMPELL
- **Inhibition of Deterioration of Cracked Gasoline During Storage**—*By* C. J. PEDERSEN
- **The Effect of Sulfur Compounds on Octane Number of Leaded Fuels**—

  Part I—Comparison of Different Sulfur Compounds

  Part II—Sulfur Antagonism in Different Fuels

  By H. K. LIVINGSTON

DID YOU KNOW

. . . that Du Pont makes many products used in the automotive field? These include the famous No. "7" line of radiator cleansers, sealers, and inhibitors, No. "7" Polish and "Duco" Wax, "Zerone" and "Zerex" anti-freeze solutions, and many others.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *Through Chemistry*

MAKE DU PONT THE SOURCE FOR ALL OF YOUR GASOLINE ADDITIVES . . .

- TETRAETHYL LEAD COMPOUNDS *(Motor Mix—Aviation Mix)*
- ANTIOXIDANTS
- METAL DEACTIVATOR
- DYES

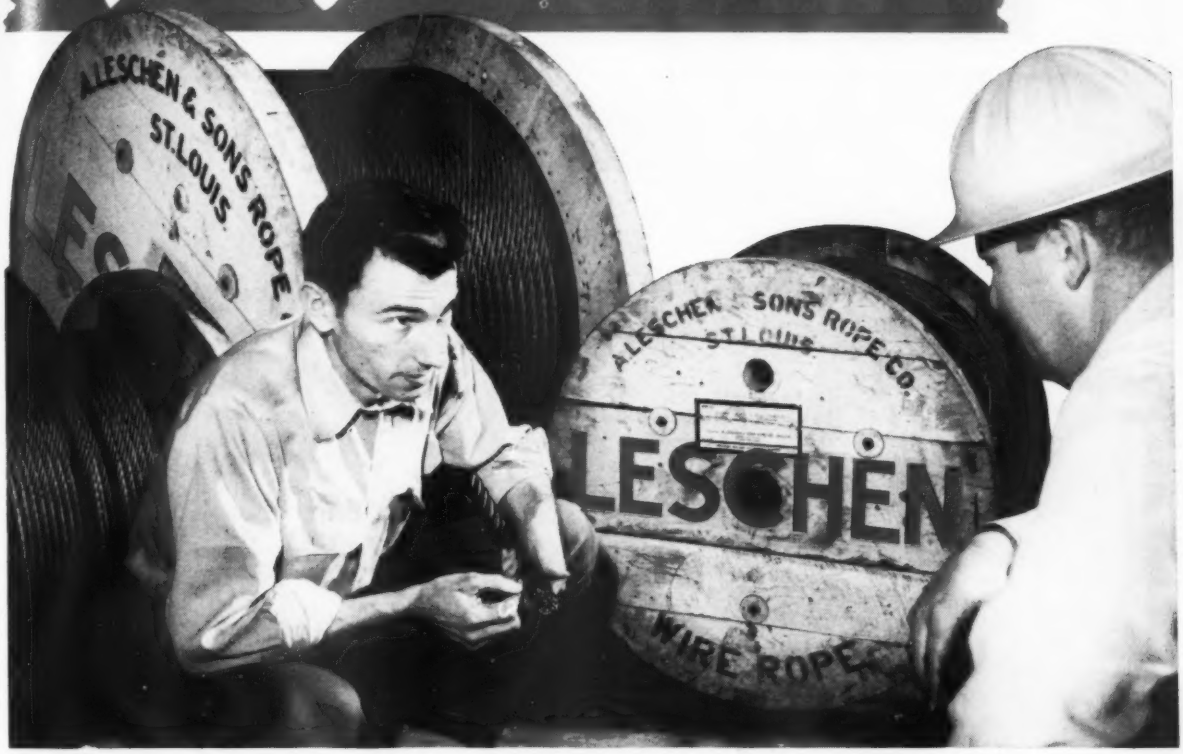
E. I. DU PONT DE NEMOURS & COMPANY (INC.)
PETROLEUM CHEMICALS DIVISION
Wilmington 98, Delaware

District Laboratories: Wilmington, Del. · Chicago, Ill. · Tulsa, Okla. · Houston, Texas · El Monte, Calif.

District Offices: Wilmington, Del. · Chicago, Ill. · Tulsa, Okla. · Houston, Texas · Los Angeles, Calif.

A-5

Good folks to know



LESCHEN wire rope is preferred by men who know it. It coils smoothly, rolls easily on the cat-head, is dependable for uniform strength and long life. Leschen red strand wire rope — recommended by your United man — is one of the many United products which will be better for your business. Get acquainted with United men, they are good folks to know.

Uncle Sandy THE UNITED SUPPLY MAN

UNITED SUPPLY
AND *Manufacturing* COMPANY
TULSA, OKLAHOMA
Stores in Kansas, Oklahoma, Texas, Louisiana, and New Mexico

NEW

SERIES 12100*

FORGED STEEL

DROP

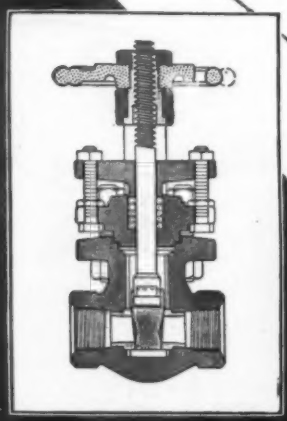
Vogt

BOLTED BONNET
BOLTED GLAND

150-800 POUND

GATE VALVES

SIZES 1/4" to 2"



*Series 12100

CARBON STEEL | 800 Pounds @ 750° F.
1500 Pounds Cold Non-Shock

For 150-800 pounds service • Round Bolted Bonnet • Bolted Gland • Gasket or Ground Joint • Outside Screw and Yoke • Renewable Seat Rings • Solid Wedge — Slotted Type • Rising Stem 11½-13% Chrome Stainless Steel Trimmings • Sizes 1/4" to 2" inclusive.

HENRY VOGT MACHINE CO. *Louisville 10, Ky.*

BRANCH OFFICES: NEW YORK • PHILADELPHIA • CLEVELAND • CHICAGO • ST. LOUIS • DALLAS

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Be <u>sure</u> with Pure

THE PURE OIL COMPANY

Marketing Offices in Principal Cities of the Eastern, Central and Southern States
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XUM

For power, for value, for every job
THEY'RE GREATER THAN EVER

Year after year the nation's truck users buy more Chevrolet trucks than any other make. For every kind of trucking job they prefer Chevrolet power and Chevrolet value.

Now, Chevrolet's two rugged valve-in-head engines give more power than ever. Advance design, solid construction and low prices give Chevrolet more value than ever.

Prove it to yourself. See the new Chevrolet P·L Trucks. Check them for popularity, performance, payload and price. In 1950 they are more than ever America's best truck buy!

CHEVROLET MOTOR DIVISION, *General Motors Corporation*, DETROIT 2, MICH.

LEADING WITH ALL THESE PLUS FEATURES:

• TWO GREAT VALVE-IN-HEAD ENGINES: the New 105-h.p. Load-Master and the Improved 92-h.p. Thrift-Master—to give you greater power per gallon, lower cost per load • THE NEW POWER-JET CARBURETOR: smoother, quicker acceleration response • DIAPHRAGM SPRING CLUTCH for easy action engagement • SYNCHRO-MESH TRANSMISSIONS for fast, smooth shifting • HYPOID REAR AXLES—5 times more durable than spiral bevel type • DOUBLE-ARTICULATED BRAKES—for complete driver control • WIDE-BASE WHEELS for increased tire mileage • ADVANCE-DESIGN STYLING with the "Cab that Breathes" • BALL-TYPE STEERING for easier handling • UNIT-DESIGN BODIES—precision built.

CHEVROLET

P*·L*

ADVANCE-DESIGN TRUCKS

P*opularity L*eaders
Chevrolet trucks outsell all others. In every postwar year truck users have bought more Chevrolets than any other make—proof of the owner satisfaction they have earned throughout the years.

P*erformance L*eaders
The new Chevrolet P·L trucks give you high pulling power over a wide range of usable road speeds—and on the straightaway, high acceleration to cut down total trip time.

P*ayload L*eaders The rugged construction and all-around economy of Chevrolet P·L trucks cut operating and repair costs—let you deliver the goods with real reductions in cost per ton per mile.

P*rice L*eaders From low selling price to high resale value, you're money ahead with Chevrolet trucks. Chevrolet's rock-bottom initial cost—outstandingly low cost of operation and upkeep—and high trade-in value, all add up to the lowest price for you.

A Really TROUBLE-FREE

Double-Duty Draw Works

U-34D

Double Drum Drilling Unit

SHALLOW WELL DRILLING (4,500 ft.)
DEEP WELL SERVICING (8,000 ft.)

Drillers say the U-34D operates smoother, and gives more hours of trouble-free performance than any similar type draw works they ever used. And, no wonder! The U-34D has many of the same engineering features found in rigs of much greater capacities.

We have records of it being used for drilling far beyond its rated capacity without a sign of trouble. Investigate the U-34D. Write for complete information or see your Supply Store.

UNITRIG & EQUIPMENT CO.
TULSA, OKLAHOMA U.S.A.

DESIGNED FOR THE JOB . . .

Exclusive Export Representative
MID-CONTINENT SUPPLY CO.
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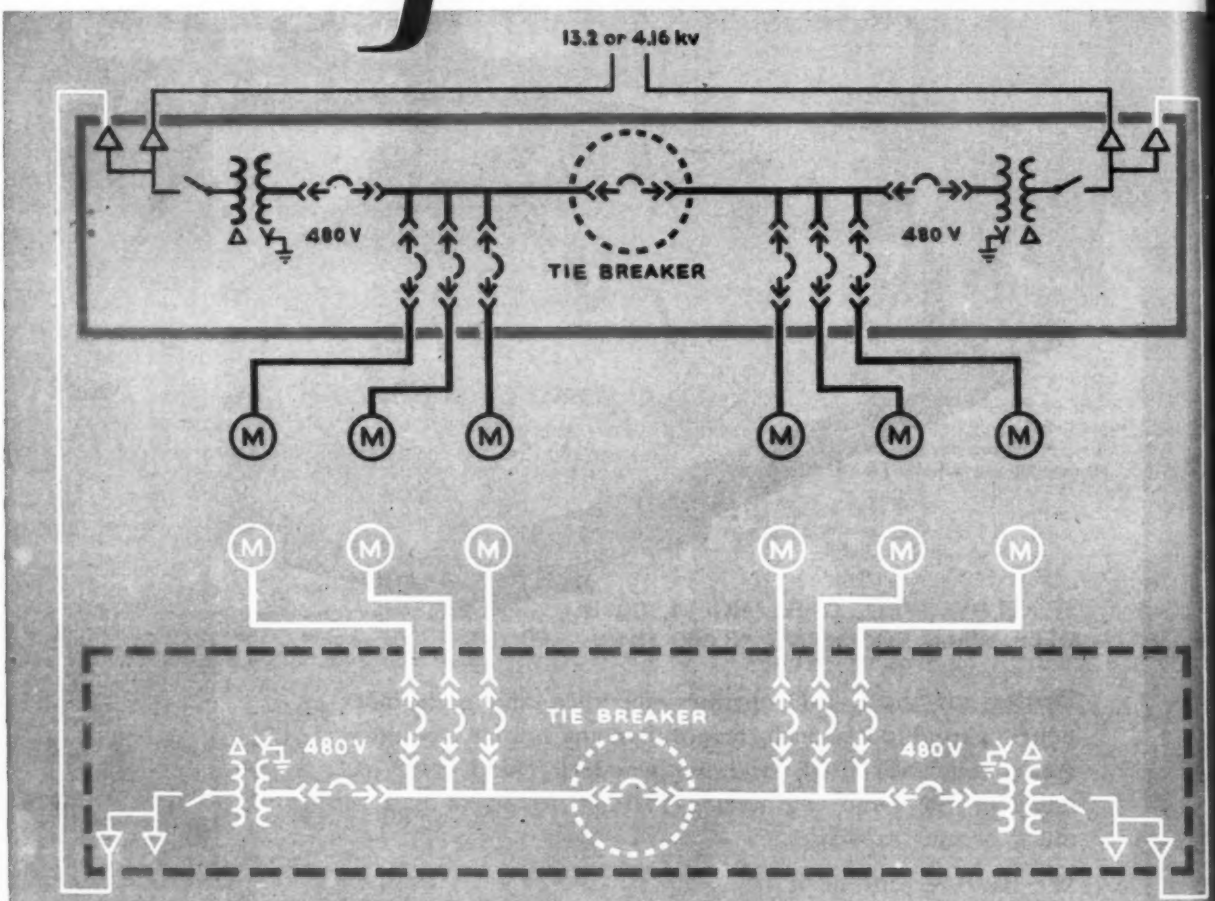
What's the trend in refinery electrification?

secondary



As this one-line diagram shows, the heart of a secondary selective system is a double-ended unit substation or a pair of single-ended unit substations with a normally-open tie circuit breaker between them. Note how easily the system is expanded by adding more units, either single-ended or double-ended (as shown in white) without requiring new secondary switchgear on existing units. The neutral of the 480-volt system may be grounded for greater service continuity, increased safety, and lower-cost operation.

Here's what you need to modernize your power system!

WHEN YOU COME TO GENERAL ELECTRIC you get far more than the finest in electrical equipment. A General Electric application engineer, familiar with refinery practices, is at your disposal. If desired, he stands ready to assist you in co-ordinating all the needed components, engineering your power distribution into one modern, efficient system.

XUM

S

O

XU

selective distribution systems

WITH UNIT SUBSTATIONS

—to protect continuity of service at minimum cost

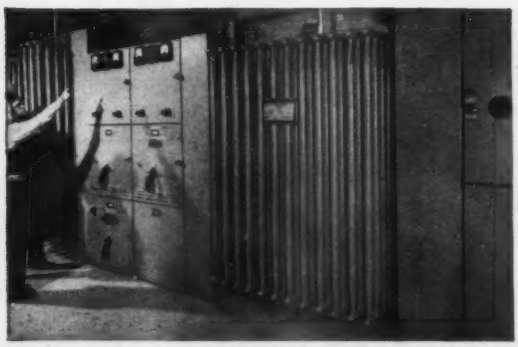
What's behind the growing refinery practice of distributing power through secondary selective systems? Primarily it's recognition of the fact that for most plants it provides a simple, low-cost way to safeguard service continuity for operations requiring uninterrupted production.

This method utilizes a normally-open tie circuit breaker between the secondaries of two transformers in a double-ended unit substation. The tie provides an alternate source of power for secondary circuits if either transformer becomes de-energized by a fault in the primary circuit. In effect, it enables one "partner" when necessary to carry the essential load.

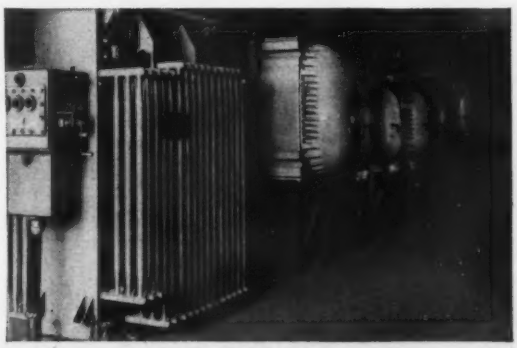
Simplicity is another advantage of this system. Operating personnel need no special training to operate and maintain the equipment contained in a double-ended unit substation—chiefly transformers and manually-operated drawout air circuit breakers.

Moreover, expansion is easy and economical. Single-ended or double-ended substations can be added at will. Since no added interrupting duty is imposed, no new secondary switchgear is needed on existing units. Full data is contained in Bulletin GET-1438, "Secondary Networks for Industrial Plants." Send for your copy today. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

TO HELP CUT YOUR POWER DISTRIBUTION COSTS . . . Don't miss seeing the "More Power to America" full color and sound slide-film "Modern Industrial Power Distribution." It's packed with helpful, cost-cutting ideas you can use. Ask your G-E representative to arrange a showing for your organization.



G-E double-ended load-center unit substations for non-hazardous areas are compact, factory-assembled "packages." Shipped ready to install, they are furnished in flexible combinations of incoming-line and secondary-circuit arrangements with transformers from 100 to 2000 kva.



For semi-hazardous areas, G-E double-ended load-center unit substations have easily removable air circuit breakers, each in Class I, Group D enclosures, plus primary power circuit breaker, a standard Pyranol (R) transformer section, and a secondary bus enclosure.

GENERAL ELECTRIC

661-12

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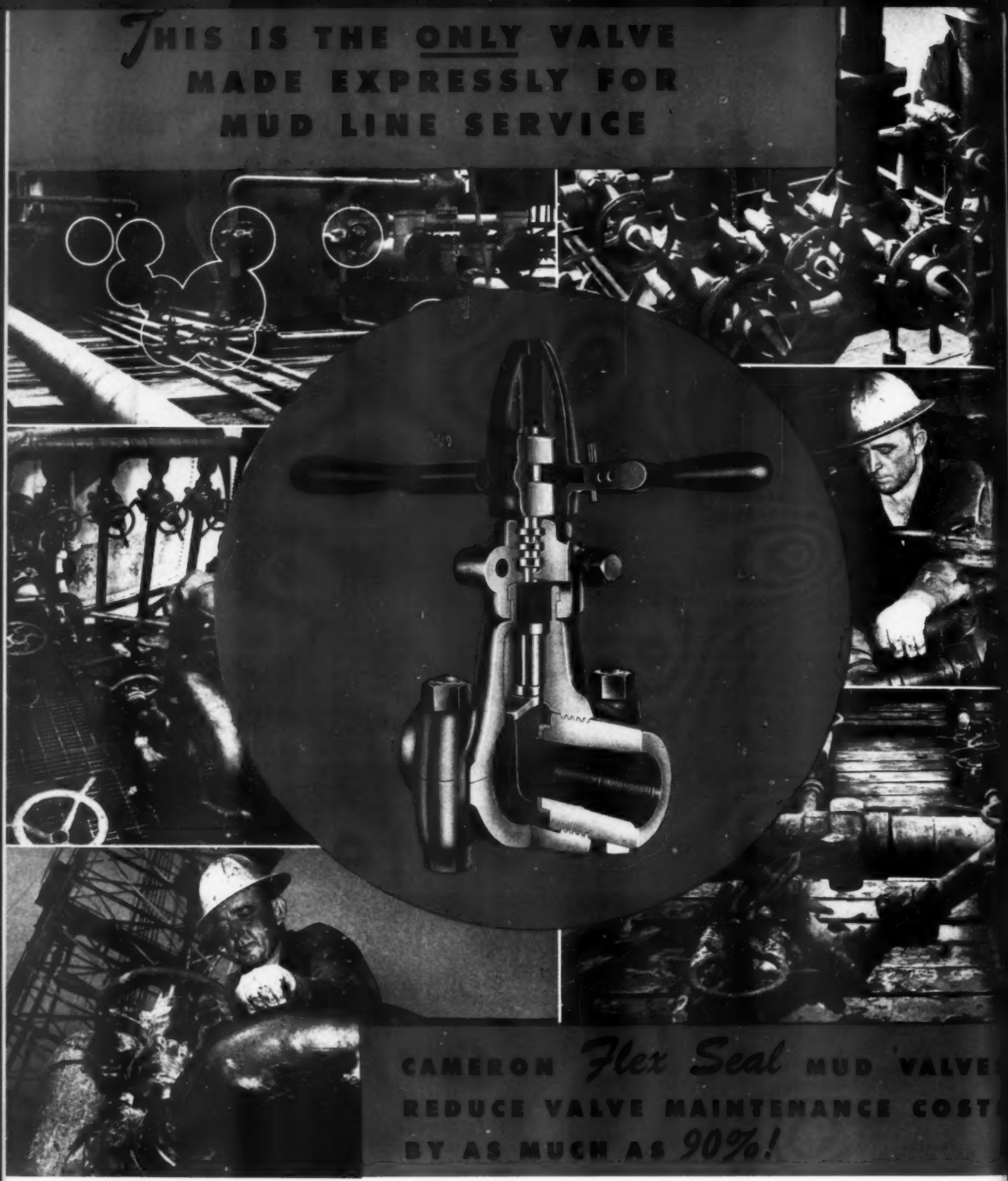
THIS IS THE ONLY VALVE MADE EXPRESSLY FOR MUD LINE SERVICE



CAMERON *Flex Seal* MUD VALVES REDUCE VALVE MAINTENANCE COSTS BY AS MUCH AS *90%!*

Cameron

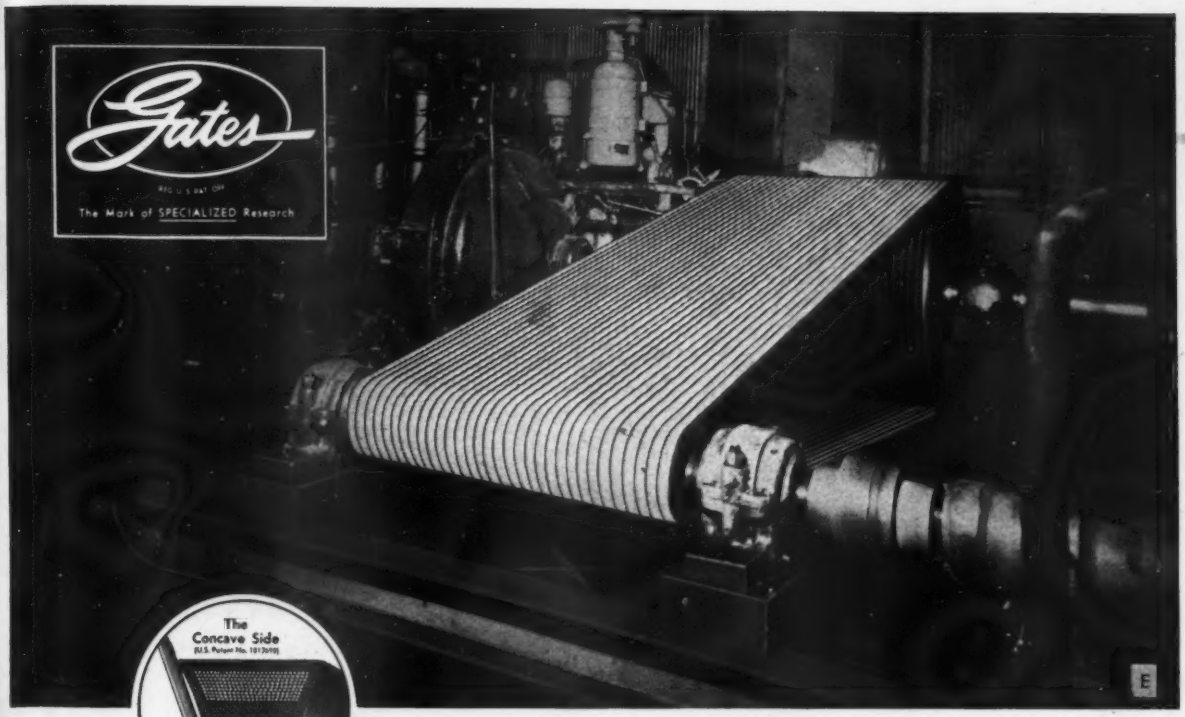
IRON WORKS, INC.

P. O. BOX 1212, HOUSTON, TEXAS

EXPORT: 74 TRINITY PLACE, NEW YORK, N. Y.

There's no other valve like a Cameron "Flex-Seal" for, unlike ordinary gate valves and stop cocks which were designed for a number of services, "Flex-Seals" were designed expressly for use on lines handling abrasive fluids: drilling mud, cement slurry, etc. The cutting action of these fluids is absorbed by a resilient rubber flow-way insert which, after long service, may be quickly and easily replaced by the drilling crew. No special tools are required and the new insert costs only a few dollars.

Available in 1000, 2000, 3000 and 5000 lb. working pressure models, and in full range of sizes up to 4-inch. See your Composite Catalog for complete mechanical details or descriptive literature will gladly be sent on request.



The cylinder at the right houses a 75-stage centrifugal pump. It requires 112 H.P., turns at 36000 r.p.m., and maintains a 1925-ft. head in an oil field water repressuring project. The belt speed is high, nevertheless, the Gates Vulco Rope Drive is doing a fine job, say the owners.

Here is exactly *WHY* the Concave Side Saves You Money in V-Belt Costs

When *any* V-belt bends in going around its pulley, it is forced to *change* its *shape.*

Naturally so, because the top of the belt is under tension and grows *narrower* while the body, under compression, *bulges out!*

This change of shape in a *straight-sided* V-Belt, is shown in figures 1 and 1-A—and you will note how the bulging sides press *unevenly* against the V-pulley.

Now look at figures 2 and 2-A. There you see how this change of shape, due to bending, affects the belt that is built with the Concave Side—the Gates Vulco Rope. The precisely engineered Concave Side exactly corrects the side-bulge—and the bent belt *has a shape that exactly fits its sheave groove!*

Two distinct savings result. *First*—There is no side-bulge to cause uneven wear. The sides press *evenly* against the V pulley and therefore wear *uniformly*—resulting in *longer life!* Second—The *full width* of the sidewall grips the pulley—thus carrying heavier loads without slippage—and this *saves belts* and also saves *power!*

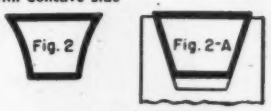
When you buy V-Belts, be sure you get the V-Belt with the Concave Sides... the Gates Vulco Rope!

What Happens When a V-Belt Bends

Straight-Sided V-Belt

How Straight Sided V-Belt Bulges in Sheave-Groove. Sides Press Unevenly Against V-Pulley Causing Extra Wear at Point Shown By Arrows.

Gates Vulco Rope with Concave Side



No Side Bulge. Precise Fit in Sheave Groove. Sides Press Evenly Against V-Pulley—Uniform Wear—Longer Life!

CS-505

THE GATES RUBBER COMPANY
DENVER, U.S.A.
The World's Largest Makers of V-Belts

GATES VULCO ROPE DRIVES
Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U.S. and 71 Foreign Countries

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Save Time Save Travel

with this one stop supply service

79 stores for your convenience!

Jones & Laughlin Supply Company

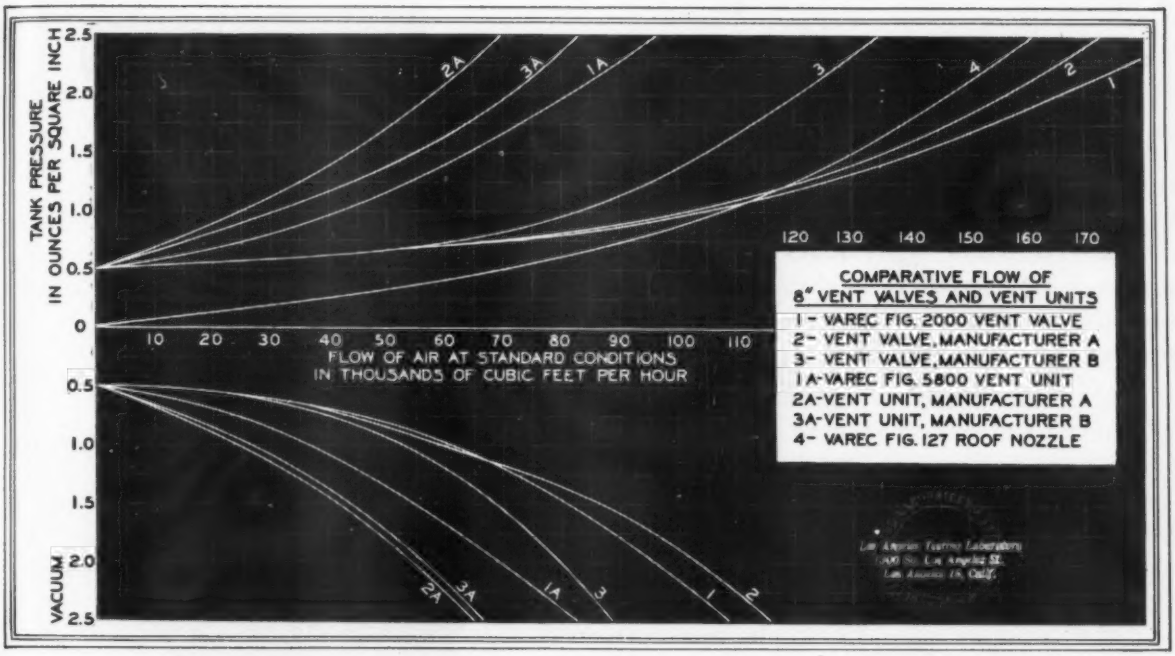
"...here's MY warehouse!"

Subsidiary of Jones & Laughlin Steel Corporation

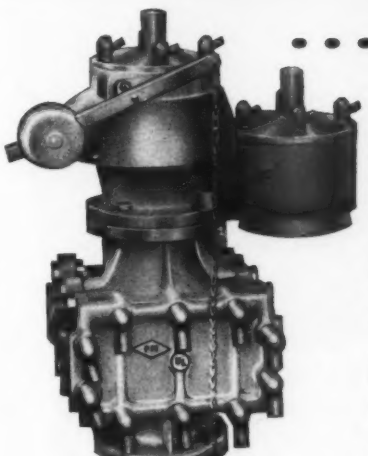
J&L STEEL

TULSA, OKLAHOMA

CUT YOUR TANK VENTING costs


TANK PRESSURE IN OUNCES PER SQUARE INCH
2.5
2.0
1.5
1.0
0.5
0
0.5
1.0
1.5
2.0
2.5
VACUUM
10 20 30 40 50 60 70 80 90 100 110
FLOW OF AIR AT STANDARD CONDITIONS IN THOUSANDS OF CUBIC FEET PER HOUR
120 130 140 150 160 170
2A 3A 1A 3 4 2 1
COMPARATIVE FLOW OF 8" VENT VALVES AND VENT UNITS
1 - VAREC FIG. 2000 VENT VALVE
2 - VENT VALVE, MANUFACTURER A
3 - VENT VALVE, MANUFACTURER B
1A - VAREC FIG. 5800 VENT UNIT
2A - VENT UNIT, MANUFACTURER A
3A - VENT UNIT, MANUFACTURER B
4 - VAREC FIG. 127 ROOF NOZZLE

. . . how much does it flow?



"VAREC" Figure No. 5800A Conservation Vent Unit—consists of Figure No. 2000A Vent Valve and Figure No. 50 Flame Arrester.

Compare vent valves on a basis of flow and you may find that a smaller valve or even a single valve instead of two has sufficient capacity to do your job. Even if the same size is required, *the valve with most flow capacity gives you the greatest tank protection.*

With flow capacity so vital in vent valve selection, either the "VAREC" Figure No. 2000 Series Conservation Vent Valves or the "VAREC" Figure No. 5800 Series Vent Units are your most economical buy. The flow path through the Figure No. 2000 Valve is similar to that of a high-gas-velocity turbine nozzle. As a result, this valve, mounted on a nipple, not only flows more than the nipple alone, but flows more than the nipples could theoretically flow alone.

Flow through all vent units is governed by the flame arresters. "VAREC" Figure No. 50 Flame Arresters have largest net free area and permit highest flow with required safety against flame propagation. They are listed by Underwriters' Laboratories and approved by Associated Factory Mutuals Laboratories and other governing agencies.

Certified flow curves are available for all sizes of "VAREC" Vent Valves and Units. Compare these and demand "VAREC" Tank Venting Equipment on your tanks for the best in safety and economy.

THE VAPOR RECOVERY SYSTEMS COMPANY
COMPTON, CALIFORNIA, U. S. A.
Cable Address: VAREC COMPTON USA (All Codes)
New York — Boston — Pittsburgh — Chicago — Detroit — St. Louis — Houston
Tulsa — Casper, Wyo. — Provo, Utah — Los Angeles — San Francisco — Seattle

CP-14

PROVED and APPROVED "Varec"

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YOU DON'T HAVE TO PAMPER

THE "King-clip" VALVE!

Fig. 1640

Iron Body Bronze Mounted "KING-CLIP" Gate Valve 150 lb. S.P.—200 lb. W.O.G. For steam, water, gas, air, oil and gasoline service.

THIS STURDY IRON BODY GATE VALVE is built to stand the gaff of hard usage. It is a composite of the strong construction of the original "Clip" valve pioneered by Lunkenheimer many years ago and improved design features to meet modern-day conditions. It provides maximum resistance to distortion, piping stresses and wrenching strains.

Aside from its basic rugged proportions, the "KING-CLIP" embodies these distinctive features: • non-corrosive stem-thread bearing cast in bonnet • large drain channels that really drain the bonnet • sharply tapered bronze disc that seats tight • bronze rolled-in seat rings • coarse stuffing box threads that resist corrosion and stripping • hexagon head gland • Lunkenheimer-developed stem material that eliminates stem-thread failure due to wear • easy disassembly for servicing.

Ask for Circular No. 561 which illustrates the numerous patterns in which the "KING-CLIP" is available—iron body trim with bronze and various alloys, and all-iron . . . for a wide variety of services. You'll find one or more types which you can use to profitable advantage.

LUNKENHEIMER DISTRIBUTORS

save you money...and "headaches"!

Distributors' stocks and service are a money-saving and time-conserving convenience. The more you use these handy facilities, the less you need spend for stock-room inventory and "sleuthing" for sources of supply. Call your Lunkenheimer distributor and profit from his unfailing service—not only on valves, but on the numerous other commodities necessary to keep industry in pace with the needs of these fast-moving times.

ESTABLISHED 1862

THE LUNKENHEIMER CO.

"QUALITY"

CINCINNATI 14, OHIO, U.S.A.

NEW YORK 13 • CHICAGO 6 • BOSTON 10 • PHILADELPHIA 34

EXPORT DEPT. CINCINNATI 14, OHIO, U.S.A.

The "King-clip" is king of all clip type valves!

breaking clods, trimming and smoothing the ditch bottom of the world's largest pipe line, the Oliver "HG" Crawler Tractor and its dozer is in a class by itself.

This powerful little tractor . . . the smallest crawler tractor in the industrial field . . . can work right down in the ditch. Its rugged construction and husky power make light work of toughest going.

The maneuverability of the Oliver "HG" makes it ideal for this application as it does for so many other oil field applications. It teams up with the bigger tractors to save you time and money . . . efficiently perform the many smaller jobs where the power of a big tractor is unnecessary, or working areas are restricted. With its full line of useful auxiliary equipment, it can help you save time and money around the rigs, the refineries or the pipe line.

For complete information on the Oliver "HG" and its auxiliary equipment, write The Oliver Corporation, Industrial Division, Cleveland 17, Ohio.

THE OLIVER CORPORATION

Industrial Division: 19300 Euclid Avenue, Cleveland 17, Ohio

A complete line of industrial wheel and crawler tractors

Oliver "HG" Crawler breaks clods, trims and smooths ditch bottom.

Tops ..on the bottom!

XUM

There's no PARTIAL safety

Where safety valves are involved, "safety" must be absolute!

In no other valve can you find the extra safeguards incorporated in CONSOLIDATED Safety Relief Valves. The fixed capacity is built in —not dependent on the position of multiple and adjustable blow-down rings.

One single adjustment controls blow-down without disturbing lift or secondary annular orifice areas.

Under discharge piping stresses, the outside bevel seat and floating guide prevent leakage.

CONSOLIDATED Safety Relief Valves are so simple in design there are 25% fewer parts than in ordinary safety relief valves. Obviously maintenance costs are reduced and utmost economy is achieved.

Specifying "CONSOLIDATED" is wiser than knowing what was to blame for the accident that needn't happen. Be *surely* safe.

CONSOLIDATED SAFETY RELIEF VALVES

A Product of

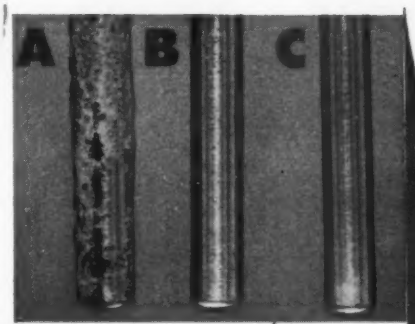
MANNING, MAXWELL & MOORE, INC.
TULSA, OKLAHOMA

Makers of 'Consolidated' Safety and Relief Valves, 'American' Industrial and 'Microsen' Electrical Instruments, 'Hancock' Valves, 'Ashcroft' Gauges. Builders of 'Shaw-Box' Cranes, 'Budgit' and 'Load Lifter' Hoists, and other lifting specialties.

Concentrations of Santolene C i... tests with gasoline are as follows: (A) No Sant... C, test failed; (B) 10 ppm. Santolene C effe... but test failed; (C) 20 ppm. Rust absent. Test ...

test Monsanto SANTOLENE C

SEE HOW IT CAN STOP RUST IN YOUR LINES AND TANKS



Concentrations of Santolene C in tests with fuel oil are as follows: (A) No Santolene C, test failed; (B) 10 ppm. Santolene C effective but test failed; (C) 20 ppm. Rust absent. Test passed.

Send for a sample of Monsanto's newly developed Santolene C. See how it stops rust when added to petroleum products. Figure how much Santolene C can save you in preventing damage to pipe lines or tanks! See if you don't agree that Santolene C is one of the most important petroleum additive developments in years.

Santolene C is effective when used in small amounts. That makes it economical. The cost of inhibiting rust in a 42-gallon barrel of gasoline or fuel oil is ...ually less than two-tenths of a cent ($0.002).

...d for your sample of Santolene C today. It will be ...rushed to you without cost . . . without obligating yo... or your company. For quick response, mail the co...pon. MONSANTO CHEMICAL COMPANY, Organic ...hemicals Division, 1745-C South Second Street, St. Louis 4, Missouri.

Santolene: Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS AND PLASTICS

MONSANTO CHEMICAL COMPANY
Organic Chemicals Division
1745-C South Second Street, St. Louis 4, Missouri.

Please send, without cost or obligation, sample and data on Monsanto's Santolene C.

Name..... *Title*.....

Company.....

Street.....

City..... *Zone*..... *State*.....

SERVING INDUSTRY . . . WHICH SERVES MANKIND

This Simple Compressor Meets the Complex Needs of a Changing Petroleum Industry

It's the Nash!

Here is a compressor presenting advantages found in no other device. Nash Compressors have only one moving part, rotating without metallic contact with the pump casing. No internal lubrication is required. Yet they produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure.

There are no valves, gears, pistons, sliding vanes, or other complicated wearing parts in a Nash. Compression is secured by an entirely different principle of operation. Because of this, gas pumping problems difficult with ordinary pumps are often easily handled by the Nash. For example, Nash Pumps are standard equipment in the Synthetic Rubber Industry, where they have met the needs of new and difficult processes.

Nash Compressors are compact and save space. They run without vibration, and compression is without pulsation. They maintain original performance over long periods. Service is assured by a nationwide net-work of Engineering Service offices. Instructive bulletin shows how they operate. Write for it.

- One moving part.
- No internal wearing parts.
- No valves, pistons, or sliding vanes.
- No internal lubrication.
- Low maintenance.
- Slugs of liquid entering pump do no harm.
- Non-pulsating pressure.
- Saves floor space.
- 75 pounds in a single stage.

NASH ENGINEERING COMPANY
273 WILSON, SO. NORWALK, CONN.

NEW RAYTHEON TWO-WAY RADIOPHONE

MODEL UM 30
(30 WATT)
Mobile
RADIOPHONE

- **Requires less space — easier to install.**
- **Lowest battery drain — no special batteries or generators required.**
- **Meets all new F. C. C. requirements including adjacent channel operation and modulation limiting (deviation control).**
- **Available in both single and dual channel models covering the entire 152-174 mc. frequency range.**

Compact. Transmitter-receiver unit only 5" x 6⅞" x 15" — installs anywhere in cab or trunk corner.

Low Drain. Requires only 29.5 amps. transmit: 10 amps. operate: 7 amps. standby (receiver only).

Clear Reception. Unit containing speaker, control and power supply is mounted under dash for best acoustical performance and accessibility of controls. This unit incorporates an improved variable squelch control which automatically adjusts itself to prevailing signal and noise conditions.

Easy Installation. Mountings easily installed — or use existing fittings. Covers of both units hinged and latched for quick access.

All Accessories. Furnished complete with car top antenna, military-type microphone with Koiled Kord or telephone hand set, mounting hardware, cables, connectors, etc.

MODEL US 60
(60 WATT)
Base Station
EQUIPMENT

with desk-type control console

The ultimate in 60 watt fixed station equipment. Meets the exacting requirements of industrial, commercial and governmental users. The handsome broadcast-studio-type desk console provides every desirable feature of a fixed station control unit (electric clock, complete metering, etc.)† Designed throughout for maximum convenience, efficiency, ease of operation and simplified servicing. The US 30 — 30 watt base station system, is also available. †Other types of fixed station mounting arrangements are available.

LOOK TO RAYTHEON

For Complete EQUIPMENT

The Raytheon line includes a complete selection of high-performance, easy-to-operate 25-50 and 152-174 mc. mobile and fixed station two-way radiophone equipment. Also complete accessory equipment: remote control units, monitoring receivers, receiver selectors, high gain central station antennas, coaxial cables, fittings and test equipment including frequency monitors.

For Complete SERVICE

The entire Raytheon team of Engineering . . . District Sales and Field Service, including our Washington office . . . plus 200 independent sales-service organizations, is ready to serve you with technical help in planning and selecting equipment, filing FCC application and obtaining utmost service and satisfaction from Raytheon equipment.

RAYTHEON

Excellence in Electronics

RAYTHEON
MANUFACTURING COMPANY
WALTHAM, MASSACHUSETTS

Sold Exclusively in Canada by Canadian Marconi Co., Marconi Bldg., St. Sacrament St., Montreal

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MAIL THIS COUPON TODAY!

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Raytheon Manufacturing Co.
Waltham 54, Massachusetts
Please send complete information on Raytheon Two-Way Radiophones:
Model UM 30 (30 watt) Mobile Unit
Model US 30 (30 watt) Base Station Equipment
Model US 60 (60 watt) Base Station Equipment

NAME .....
ORGANIZATION .....
ADDRESS .....
CITY .....ZONE.....STATE.....

XUM

HOW TO SELECT A DESALTING PROCESS

Refiners with a salt problem should get satisfactory answers to these three questions before selecting a salt removal process

1 *Does it provide high-efficiency removal?*

PETRECO DESALTING is providing high efficiency salt removal for refiners everywhere. A recent survey of 42 Petreco Desalting plant installations disclosed an average removal percentage of 93.6%. This high percentage salt removal was variously credited in the refineries surveyed with an average days-on-stream increase of 204% in the topping and combination units, 136% in the cracking and combination units; a decrease in corrosion damage of 75%; a betterment of 8% in the Service Factor and an average increase in exchanger utility of 190 days (before fouling). *High efficiency salt removal assures more efficient refining — Petreco can show you recorded proof.*

2 *Is there an adequate service organization?*

PETRECO DESALTING is backed by a service organization with unparalleled know-how in the field of electric desalting. Petreco maintains resident desalting engineers close to every Petreco installation. Petreco desalting supervisors are located in all major refining areas. Petreco stocks of replacement parts are always convenient and available for emergency repairs. Petreco engineers not only design your desalter into your flow stream and supervise its construction, they regularly inspect the desalter to assure safety, proper maintenance and high-efficiency performance.

3 *Is it a tested and proved process?*

PETRECO pioneered electric desalting. With Petreco Desalting you get the most complete and authoritative assembly of electric desalting know-how extant. The Petreco research staff has been studying desalting problems for years, Petreco design engineers have been engaged exclusively in the design and construction of desalting plants, and Petreco service engineers and supervisors have been dealing with salt problems in refineries throughout the industry since the inception of Petreco Desalting. No other desalting process can assure you of more experienced personnel or provide comparable case histories of successful use.

Petreco engineers are always available to give you the facts on the economies of high-efficiency Petreco Desalting, write or call

PETROLEUM RECTIFYING COMPANY

5121 South Wayside Drive, Houston 1, Texas
648 Edison Building, Toledo 4, Ohio
530 West Sixth Street, Los Angeles 14, Calif.

PETRECO

SPECIALIZED *Electric* PETROLEUM PROCESSES { DESALTING / DEHYDRATING

PE 50-4

Mid-Continent Petroleum Corp. relies on

TAYLOR INSTRUMENTATION ON NEW FLUID CAT CRACKER

ONE of the Mid-Continent Petroleum Corporation's newest processing units is the 5-million dollar fluid catalytic cracker at their West Tulsa Oklahoma refinery. The unit was designed and erected by the M. W. Kellogg Co.

As with all cat crackers, modern instrumentation was essential to successful and economical operation. We're proud that Mid-Continent selected and used a wide variety of Taylor Instruments for their new "heat-balanced unit." Evidence of the great dependence on instrumentation is the nearly 150 Taylor Flow, Liquid Level, Pressure, Differential Pressure and Temperature Indicators, Recorders and Controllers, either directly connected or in pneumatic transmissions systems. In fact, Mid-Continent tells us that over 90% of all instrumentation in their refinery is Taylor.

One improvement over many older systems is the use of Taylor Pressure Recording Controllers on the air to the regenerator and on the density control of the stripping column.

Mid-Continent is another example of many satisfied Taylor customers who believe that Taylor Instruments speak for themselves in terms of accuracy, simplicity. dependability, higher product quality and lower processing costs. Whether your processing problems are simple or complex, there's a Taylor Instrument or control system and a competent Taylor Field Engineer ready to help you solve them. Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

▼ ▼ ▼

Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

Every important phase of the entire process is indicated, recorded and controlled from one large central control panel (Small section shown above).

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

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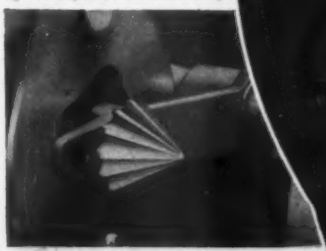
SURE... *Plenty!*

SAVE LABOR... REDUCE COSTS WITH

TOLEDO 2" PORTABLE POWER PIPE MACHINE

CONTROLS . . . entirely within forward and reversing switch. Speed adjusted automatically.



REAMING... with 12 tooth cone type flute reamer mounted on arm on cutter head.

THREADING...speedy, accurate. Thread gauge shows length of thread being cut.

CUTTING.. especially fast with 4 cutting knives. Perfect square end cuts. No burred edges.

THREAD 2" PIPE IN 22 SECONDS

Bring your costs down—save up to 80% on pipe threading time by using a portable TOLEDO No. 999 Power Pipe Machine instead of hand methods!

Gives you high production! The Super Model threads 2" pipe in 22 seconds . . . or 30 seconds with Standard Model. Cuts off 2" pipe in 10 seconds. It's versatile—quickly changed for all pipe sizes up to and including 2". It's rugged, compact, low in cost . . . with proven performance and Toledo dependability! Ask your distributor for complete details and price. Write for new catalog. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

RELY ON THE LEADER **TOLEDO**

PIPE TOOLS... POWER PIPE MACHINES... POWER DRIVES

flanged head end assembly

Brown Fintube Head End Construction Eliminates Operating and Maintenance Troubles of Ground Joints and Screw Unions

BROWN FINTUBE'S 8 advantages

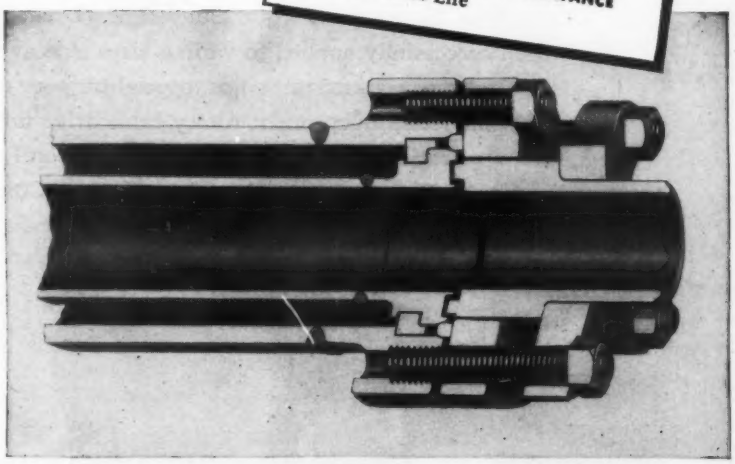
EXTREME FLEXIBILITY
Easily Adapted to Changes in Duty
NO OBSOLESCENCE
Avoiding Waste and Expense
FLANGED HEAD END ASSEMBLY
Eliminating Ground Joint Seals
EASY MAINTENANCE
Using Only Common Tools
CONTINUOUS OPERATION
No Shut-Downs For Cleaning
REDUCED STORES REQUIREMENT
Minimizing Investment and Handling
QUICK DELIVERY
Only a Few Hours in Emergency
INCREASED CORROSION ALLOWANCE
Longer Tube Life

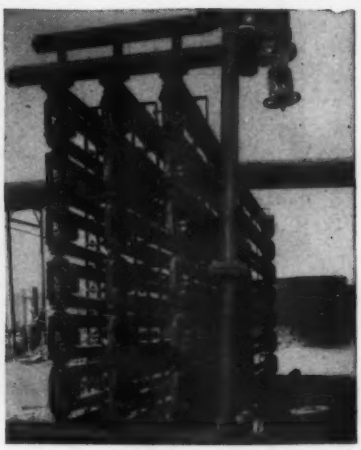
● Engineering, operating and maintenance men all enthusiastically endorse our flanged head end construction which avoids pack joints, glands, ground joint seals, screw unions, and all the operating and maintenance trouble resulting from ground joint and screw union construction.

The seating surfaces are in full view of the operator, and easily accessible. This permits them to be wiped clean of all dirt and grit before closing the seal — not possible when ground joints are used.

The metallic sealing ring used in Brown Fintube Exchangers is recognized by engineers everywhere as the ideal closure. It overcomes any slight unevenness of the seating surface and permits tight, leak-proof seals to be "made," and "broken" easily and quickly, without tortional stress or twisting — assuring trouble-free operation far surpassing that afforded by other types of closures.

For the utmost in efficiency and economy, use Brown's proven, welded fintube heat exchangers throughout your plant. Estimates and quotations furnished promptly. *Write for Bulletin No. 481.*





THE BROWN FINTUBE CO.
ELYRIA, OHIO

SECTIONAL HAIRPIN HEAT EXCHANGERS

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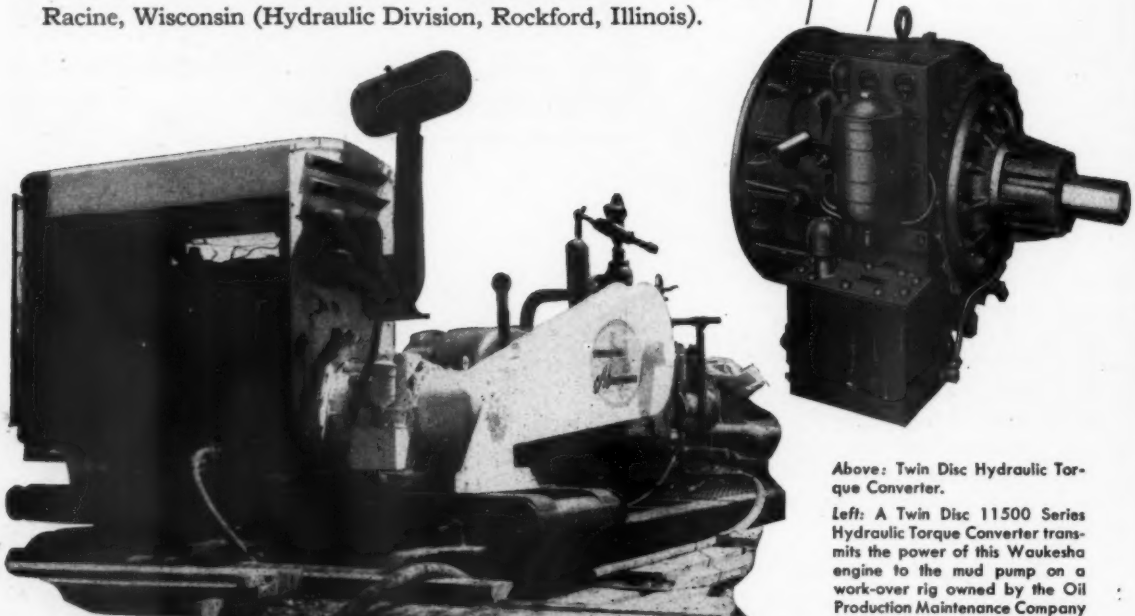
High Efficiency for pump drives

Twin Disc Torque Converters on pump drives allow your engine to operate at its most efficient speed while the pump automatically runs at the maximum speed consistent with the pressure required in pumping.

The application of a clutch-type Twin Disc Hydraulic Torque Converter also will permit the engine to be disconnected from the pump during idling periods . . . *will eliminate the need for "speed packages" to meet changing requirements in volume and pressures as the hole deepens* . . . dampen shocks and torsional vibrations effectively.

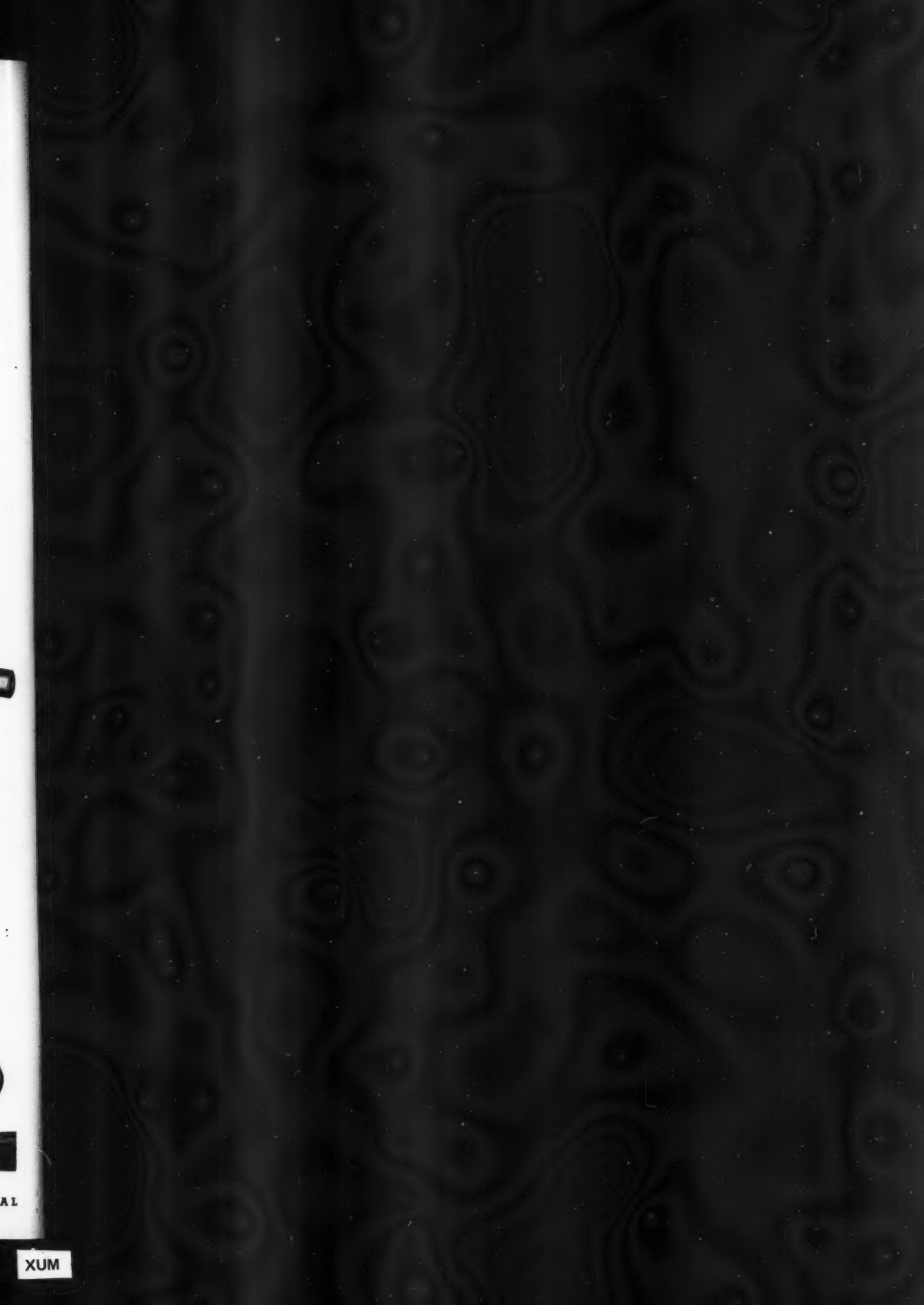
Twin Disc Hydraulic Torque Converters (Lysholm-Smith type) have been successfully applied to various sizes of heavy-duty drilling rigs, slush pumps, cementing pumps, special purpose pumps, coring reels, sand line reels, independent rotary table drive units and other specialized applications. Write the Hydraulic Division for your copy of Converter Bulletin 135-C. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).



Above: Twin Disc Hydraulic Torque Converter.

Left: A Twin Disc 11500 Series Hydraulic Torque Converter transmits the power of this Waukesha engine to the mud pump on a work-over rig owned by the Oil Production Maintenance Company of Houston, Texas. This rig drilled 47,932 feet and did five work-over jobs with trouble-free service from the Converter.

SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918



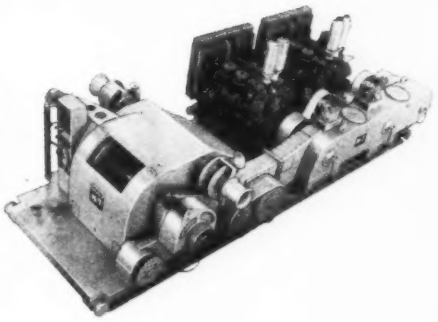
There's a BREWSTER RIG to fit any job—BETTER!

All with MATCHED EQUIPMENT

. . to 8500'

BREWSTER **N-7**

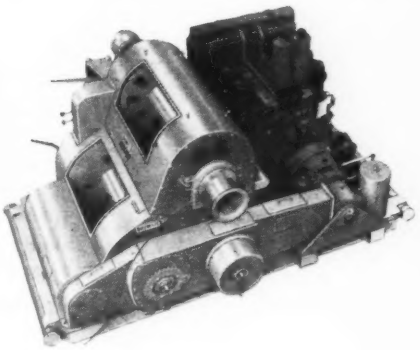
Here's POWER to spare! Reasonable INITIAL COST, high PORTABILITY, ECONOMY of operation and maintenance has proved the N-7 fits the job of 8500' programs—better. And like all Brewster rigs, it has added advantages of perfectly MATCHED EQUIPMENT and 24-HOUR FIELD SERVICE anywhere in U. S.

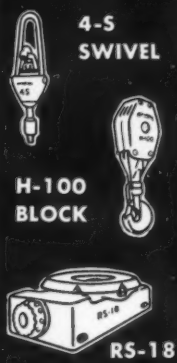


. . to 5500'

BREWSTER **N-4**

SPEED and FLEXIBILITY characterize the Brewster N-4. Entirely air controlled, Torque converter(s) automatically supply maximum engine power with minimum engine effort. It's easily moved in one load. In single or double drum models—one or two engines—single or twin torque. "Hottest" rig in years.

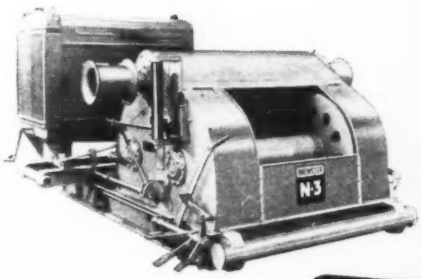


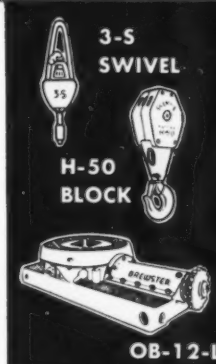


. . . to 3500'

BREWSTER **N-3**

Easy to move—fast to rig up the highly portable N-3 is unitized on a single skid with all controls at driller's position. The ideal rig for shallow drilling to 3500' or deep well servicing. The N-3 is available with single or double drum. Removable front drum cover section for convenience in well servicing.





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Manufacturers of Drilling Equipment Since 1910

SHREVEPORT, LOUISIANA

Brewster Drilling Equipment is Sold by:

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BREWSTER MATCHED Drilling Equipment

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FOR MARINE REPAIRS
OR CONSTRUCTION

Call Avondale!

Tomorrow, the next day — who knows when? You may suddenly have need for expert repair or construction. In such case, call experts — call AVONDALE . . . all types of marine work for the oil industry.

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AVONDALE MARINE WAYS, INC.

RIVER FRONT, MAILING ADDRESS: NEW ORLEANS DISTRICT WESTWEGO, LOUISIANA

MAIN PLANT: AVONDALE, LA.
QUICK REPAIR PLANT — HARVEY, LA.

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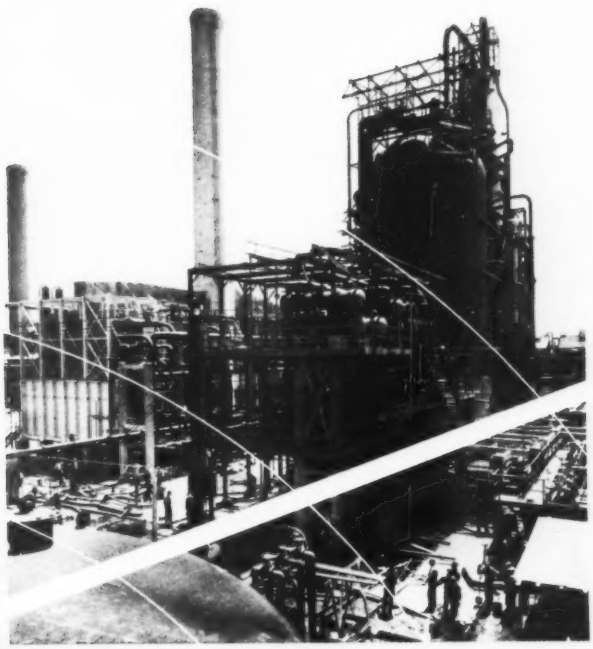

The Refiner

Foster Wheeler

construction

fabrication

engineering

design

dual control

active liaison between the Refiner and Foster Wheeler in the office, shop and field; . . .

complete agreement on every detail in the design, engineering, fabrication and construction sequence; . . .

a combined experience that can straighten out unscheduled situations . . .

These are the essential components which provide an accurate and overall dual control which saves time, saves money, and creates another satisfied Foster Wheeler customer.

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the complete engineering and construction service anywhere in the world

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63,000 bbls/day

A top-of-column view of the 63,000 bbl/day Crude Distillation Unit engineered and constructed by Foster Wheeler for the Creole Petroleum Corporation at Amway Bay, Venezuela.

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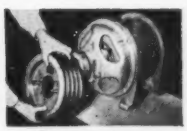
How Does Your Drive Rate on the V-drive Scoreboard?

Here are 15 money-saving features of the most efficient V-belt drive. Only Worthington Multi-V-Drives give you all 15!

These Features Save You Money	For These Reasons	It's a Worthington—
1 Two-piece QD sheave—rim and hub separate	Mount light hub first, then slide heavier rim on tapered hub	EXCLUSIVE
2 Choice of one or two-piece assembly	Mount hub and rim separately, or loosely assemble hub on rim and slide on shaft together	EXCLUSIVE
3 Split hub	Easy to mount, even on oversized shaft	ORIGINAL
4 Clamp screw in hub	Holds hub in position on shaft while setting or removing rim	EXCLUSIVE
5 Taper-mated hub and rim	Mount easily in any position—no keyway between taper surfaces	ORIGINAL
6 Large, long pull-up bolts	Hold better and more uniformly	EXCLUSIVE
7 Friction cone grip	Tightening rim on hub gives positive press fit on shaft	ORIGINAL
8 Shaft key lock (set screw over keyway)	Prevents key from drifting	EXCLUSIVE
9 Quickly-detachable (QD)	Pull-up bolts used as jack screws to remove sheave rim	ORIGINAL
10 Interchangeable rims	Hubs for every bore—lower inventory cost	ORIGINAL
11 No realignment problem	Clamped hub holds shaft position—new rim tightens up in exact alignment	EXCLUSIVE
12 Choice of "A", "B", "C" and "D" grooves	"Tailor-made" grooves give proper belt "ride-out" for maximum life efficiency	ORIGINAL
13 I-beam spokes on driven sheave	Stronger—capable of carrying heavier load with less weight	EXCLUSIVE
14 Offset design of sheave	Reduces over-hang loads—increases bearing life	ORIGINAL
15 Worthington-Goodyear V-belts	Load-carrying cords in neutral axis reduce internal friction—each belt carries its share of drive load	ORIGINAL



EASY TO GET ON

EASY TO GET OFF

YET ALWAYS TIGHT ON THE SHAFT

WORTHINGTON QD SHEAVE
—ORIGINAL TAPERED CONE-GRIP SHEAVE

Complete Range of Stock Sizes—Prompt Shipment. 853 listed stock sizes in "A", "B", "C" and "D" sections, fhp to 600 hp . . . 332 listed stock sizes of EC Cord V-belts. *Send coupon for latest Worthington QD Sheave bulletin.*

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ORIGINATORS OF THE QD SHEAVE

WORTHINGTON PUMP AND MACHINERY CORPORATION

MULTI-V-DRIVE SALES DIVISION

Buffalo, N. Y. • General Offices, Harrison, New Jersey

POWER TRANSMISSION: sheaves, V-belts, variable speed drives

PUMPS: centrifugal, power, rotary, steam

AIR COMPRESSORS: water-cooled, air-cooled

The Good Right Hand of Industry

Worthington Pump and Machinery Corporation
Multi-V-Drive Sales Division, Dept. PO-1
Buffalo, N. Y.

Send latest bulletin of Worthington Multi-V-Drives.

NAME.....

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CITY.....ZONE.....STATE.....

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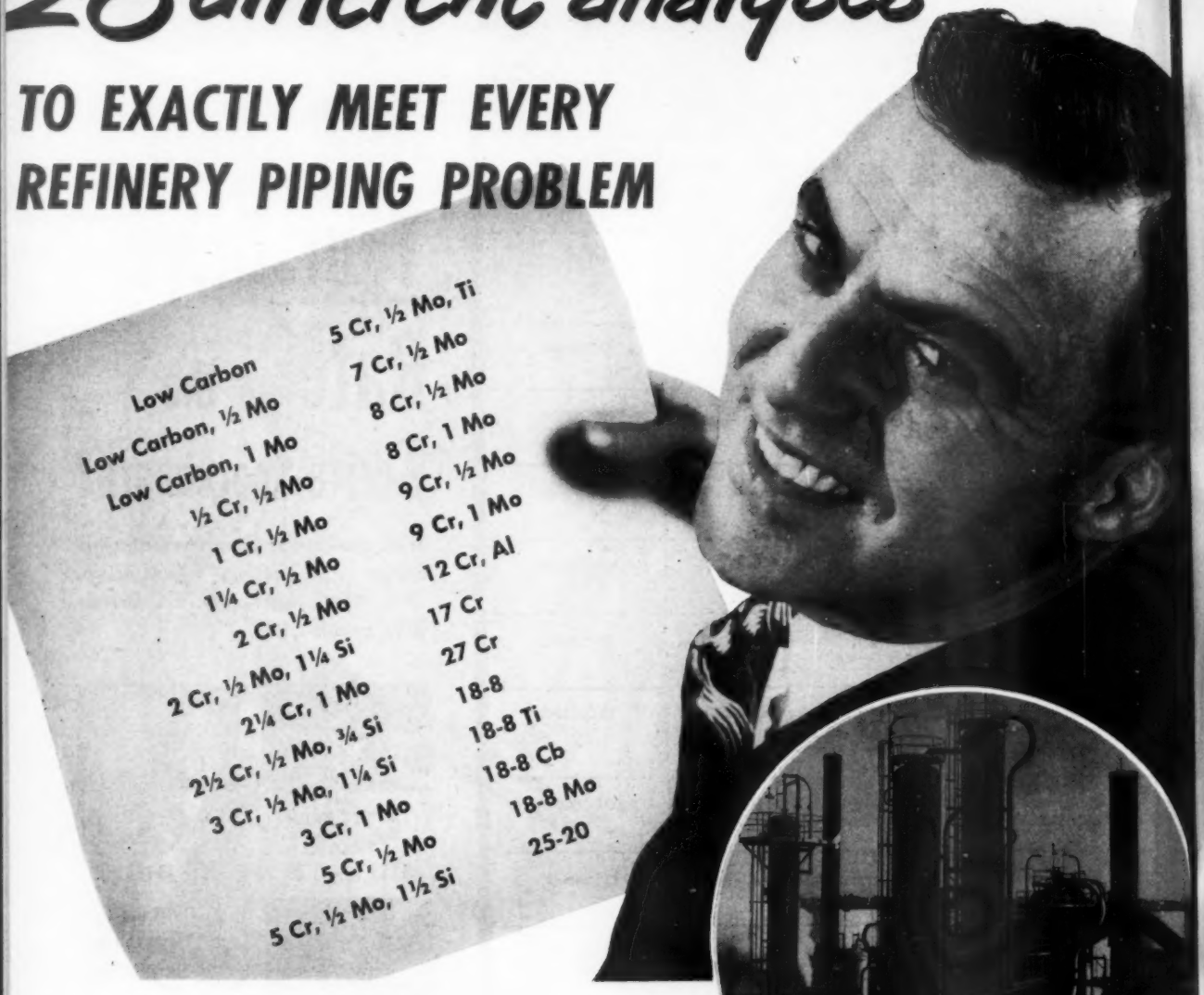
28 different analyses

TO EXACTLY MEET EVERY REFINERY PIPING PROBLEM



HERE at National Tube, we have developed 28 different analyses of still tubes, condenser and heat exchanger tubes, and refinery piping that will accommodate practically every condition of corrosion, oxidation, temperature, pressure and exposure. And our method of manufacture gives you a *seamless* tube. No welds. No joints—nothing to weaken the tube.

But remember: even with such a wide choice at your command, the selection of the proper alloy requires careful consideration. Otherwise you may end up with tubing that either does not give maximum performance or costs more than necessary.

That's why—to obtain optimum results at minimum cost—we suggest that you submit your problem to our engineers *before* you select new tubing or piping. Our huge file of successful refinery applications means that there's a good chance that we have encountered and *solved* problems just like yours before. And in case your application involves conditions that are entirely new, the wide experience of our experts will be of material assistance in finding the best solution possible.

Use this skilled background. For information, write to National Tube Company, Frick Building, Pittsburgh 19, Pennsylvania.

WALLS WITHOUT WELDS

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

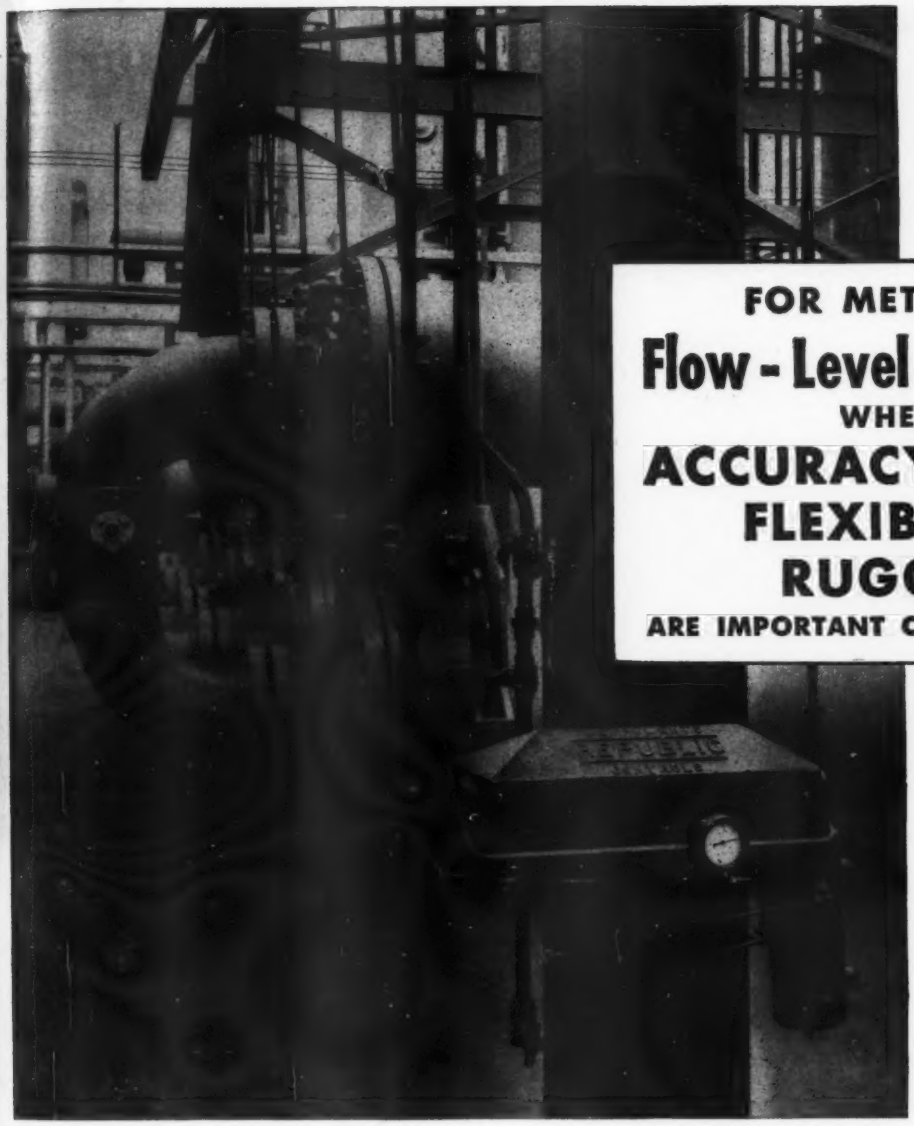
(Tubing Specialties Division)

COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

NATIONAL SEAMLESS PIPE AND TUBES

UNITED STATES STEEL



FOR METERING

Flow - Level - Pressure

WHERE

ACCURACY
FLEXIBILITY
RUGGEDNESS

ARE IMPORTANT CONSIDERATIONS

One of a group of Republic transmitters metering flow and level in a modern chemical processing plant.

Republic Pneumatic Transmitters are available for measuring flow, liquid level, pressure or liquid density of a wide range of fluids. They employ the force-balance principle to convert these process variables into air pressures which vary proportionally. These air pressures become direct measurements and can be conducted to reading instruments or used as the measuring impulse for the actuation of an automatic controller.

Republic transmitters have a guaranteed accuracy of within 1/2 of 1% of the transmitter range. By making a few minor adjustments or substituting a few small parts, their operation can be easily changed to any desired range between a minimum of 0-0.6" to a maximum of 0-704" of water. Their construction is more like that of a precision machine than of the sensitive instrument they are. Data Book No. 1001 contains complete details — write for your copy.

REPUBLIC FLOW METERS CO.

2240 Diversey Parkway, Chicago 47, Illinois

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High Tonnage Trailer Hauling with
WALTER TRACTOR TRUCKS

Provides —

- HIGH-SPEED HIGHWAY HAULING of 20-25 ton payloads within legal weight and size limitations.
- HIGH-TRACTION PULLING POWER to haul full loads to any off-highway location.

WALTER TRACTOR TRUCKS, with trailer-mounted loads, solve your urgent problem of hauling heavier loads and larger equipment over highway and off highway, without penalty of excessive size and weight—without penalty of bogging down and stalling in difficult running conditions.

The powerful Four Point Positive Drive Walter Tractor Truck, with giant 16:00-24 low pressure single tires, combined with semi or pole trailer with four similar size tires, hauls 20-25 ton payloads, gross train weights of 70,000-80,000 pounds, within legal axle loadings of 18,000-20,000 pounds.

This combination gives you proper gear ratios for fast highway hauling and powerful pulling on soft surfaces or grades. The non-slipping, 100% four wheel traction hauls steadily through sand, dirt, mud, snow. High displacement gasoline or diesel engines, 200 to 260 hp. meet every requirement.

Investigate this Walter Tractor Truck-trailer hauling method. It can revolutionize your oilfield drilling and servicing operations, with great savings in time and cost.

New WALTER FIRE FIGHTER
for speedy control of gasoline and oil fires

A giant, mobile "fire extinguisher" having tremendous power and 100% four wheel traction to speed to any outbreak at an instant's notice, through sand, mud, snow, rough terrain. Discharges 4,800 gal. of Fog-Foam per minute, to quickly smother and seal in oil or gasoline fires. Reaches 45 mph. in one minute. Write for complete specifications.

WALTER MOTOR TRUCK COMPANY
1001-19 Irving Ave., Ridgewood 27, Queens, L. I., N. Y.

WALTER
4-POINT POSITIVE DRIVE
TRACTOR TRUCKS

FOR DRILLING TO 10,000 FEET with 4½" drill pipe

WHELAND

B-85 DRAWWORKS

WITH CONSOLE CONTROL

Wheland rotary equipment to match the B-85 drawworks:

HP-14000 7½ x14 350 HP Slush Pump
A-20....20½ inch Table Top Rotary
K-2500.....250 ton Traveling Block
E-6600.....350,000 lb. cap. Swivel

COMPACT

FAST

QUIET

EASILY PORTABLE

RUGGED

PRESSURE FEED LUBRICATION

This New, Field Proven Wheland Drawworks Makes the Driller King of All He Surveys!

Never before has the driller had such easy and positive control over all drilling operations! With this new Wheland drawworks he can see the whole rig, control drilling operations accurately, quickly, easily.

4 Advantages of WHELAND CONSOLE CONTROL

1. EASY—All controls grouped at driller's fingertips.
2. SAFE—Console may be located in safest areas. Driller can easily see every part of the rig.
3. FAST—Controls respond instantly to a touch of the finger.
4. EFFICIENT—The weight carried on the bit and the speed of rotation are easily controlled.

This field proven Wheland drawworks with console control gives the driller control, visibility and safety never before available in drilling equipment. It is chock full of new performance and convenience features . . . For example: The feed-off characteristics of the Wheland air brake are similar to those of an automatic driller. Metering valve in air system allows minute adjustments in brake application. The rugged 750 HP transmission has forged steel shafts, forged steel, cut tooth, flame hardened sprockets and chain drives designed with a generous safety factor for smooth, trouble-free performance. Precision roller bearings throughout. Pressure feed lubrication . . . Get the whole story on this revolutionary new Wheland drawworks! Ask for free bulletin or

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Only **ONE** *can bear this famous name!*

Copying the Spicer Universal Joint appearance is easy enough. And commonly done. But no one else can put *into* a joint the priceless combination of ingredients, know-how and lore that makes the Spicer unit so individual . . . so exclusive in features . . . so outstanding in performance.

No other universal joint has behind it the 46-year experience of Spicer. No other engineering staff is so generously manned with competent joint-designing skill. No plant has such a big investment in universal joint production and testing equipment as Spicer. With so many features that cannot be duplicated, is it any wonder that Spicer Universal Joints are the "Standard of the Industry?"

46 YEARS OF **Spicer** SERVICE

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TRANSMISSIONS • PASSENGER CAR AXLES • CLUTCHES • PARISH FRAMES • RAILWAY GENERATOR DRIVES
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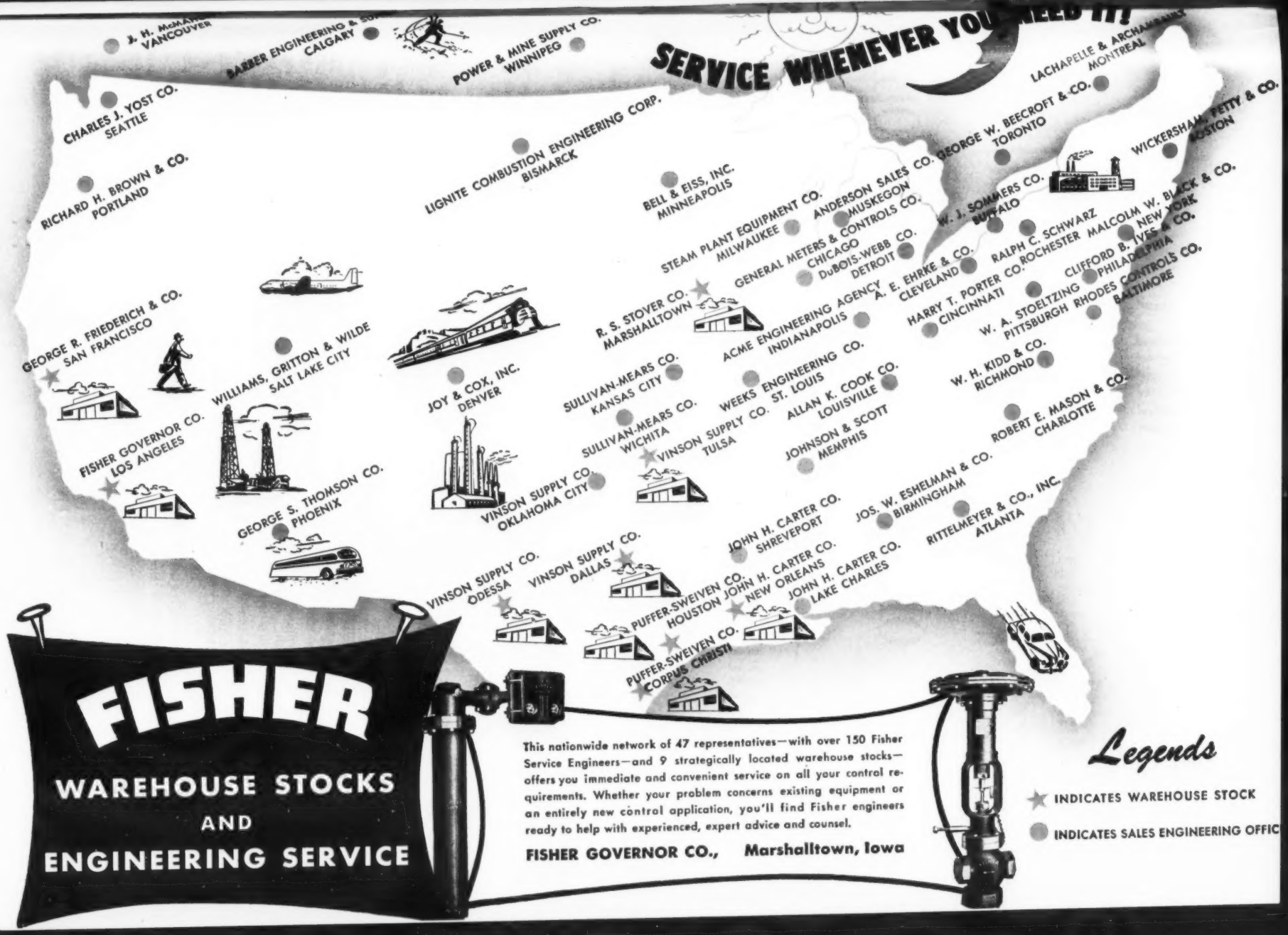
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This nationwide network of 47 representatives—with over 150 Fisher Service Engineers—and 9 strategically located warehouse stocks—offers you immediate and convenient service on all your control requirements. Whether your problem concerns existing equipment or an entirely new control application, you'll find Fisher engineers ready to help with experienced, expert advice and counsel.
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Legends
INDICATES WAREHOUSE STOCK
INDICATES SALES ENGINEERING OFFIC

Behind: An eventful decade...

Ahead: Strength to meet the oil needs of free people

STANDARD OIL COMPANY (NEW JERSEY) REPORTS FOR 1949...

THE 215,000 STOCKHOLDERS of Standard Oil Company (New Jersey) have just been sent the Company's 1949 Annual Report. Some highlights are given here.

The report covers the closing year of an eventful decade—a decade of violent action and change... of war, and war's results, of great shifts in people's living standards, and in their hopes and aims.

It was a decade which put the strength and adaptability of American business to great tests. *And proved that the American kind of business enterprise gets jobs done.*

To the oil business, these last ten years brought demands far beyond any past experience.

Standard Oil Company (New Jersey) carried well its full share of this load. More new supplies of oil were found and developed than ever before. With them came more new processes, more new products, more new jobs and job opportunities. We took in more money, and paid out more—for wages, taxes, dividends, supplies—than in any previous decade in history. And in that ten years almost four times the amount paid in dividends was invested in new facilities—strengthening the business to meet war and post-war needs.

Like all sound American business, Jersey Standard got these results through skill, initiative, teamwork and the productive use of capital. Men who work in the business of their choice—free to think and make decisions—took actions which got results and got them in time.

In reporting for 1949, this Company offers its stockholders not just the report of one business year... With it comes the hopeful assurance of strength and ability to meet the growing oil needs of free people in free lands.

HIGHLIGHTS FROM THE 1949 REPORT:

(for the consolidated companies)

PRODUCTION—957,000 barrels daily total (11% less than 1948)

REFINING—1,287,000 barrels daily total (7% less than 1948)

SALES—1,363,000 barrels daily (slightly less than 1948)

RESEARCH—$21,400,000 spent on scientific projects (6 per cent more than in 1948)

CONSOLIDATED NET EARNINGS—$268,870,000 or $8.91 a share. This compares with $365,605,000 or $12.44 a share in 1948. Total income $2,934,686,000 (12 per cent less than 1948)

PARENT COMPANY NET EARNINGS—(from which shareholders' dividends are paid) $171,707,000 or $5.69 a share. This compares with $155,923,000 or $5.31 a share in 1948.

DIVIDENDS—$4.00 a share plus one share for each 50 shares held.

EMPLOYEE RELATIONS—Again no work interruption due to labor difficulties.

• • •

Copies of the full report will be gladly sent to anyone wishing full details. Write Room 1626, 30 Rockefeller Plaza, New York 20, New York.

STANDARD OIL COMPANY (NEW JERSEY)
AND AFFILIATED COMPANIES

Here's 1 Controller that holds 2 related variables within set limits

The NEW FOXBORO M-40 AUTO-SELECTOR

This Unique Controller operates from two related measurements, automatically transferring control from one to another as required to prevent either one from exceeding its set limit. As in the case diagramed at right, when supply is greater than demand, control is maintained on the demand side (discharge) . . . but when demand exceeds supply control is maintained on the supply side (suction).

The M-40 Auto-Selector has two measuring elements and control mechanisms — also a combined air relay. It actually does the work of two instruments . . . with one or the other variable under control at all times. The transfer of control from one variable to the other is smooth, instantaneous, and with no upset. Any type of control action may be used. Any combination of related variables may be controlled - pressure and flow; temperature and level; two flows; two pressures; etc.

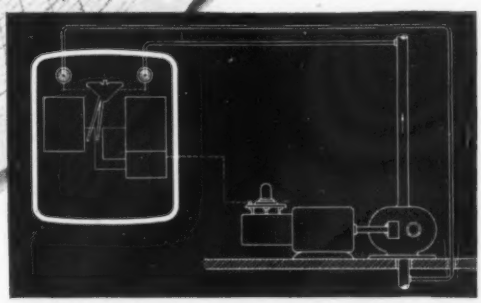

DIAGRAM *with accompanying chart above illustrates one of many applications. Pump drive is controlled to keep suction pressure from dropping below a set minimum, and discharge pressure from exceeding a set maximum. The instrument automatically controls from either variable as changing conditions require. On the chart, the outer record is for discharge pressure, the inner, for suction pressure.*

Write for details. The Foxboro Company, 60 Neponset Ave., Foxboro, Mass., U. S. A.

FOXBORO
REG. U. S. PAT. OFF.

RECORDING · CONTROLLING · INDICATING
INSTRUMENTS

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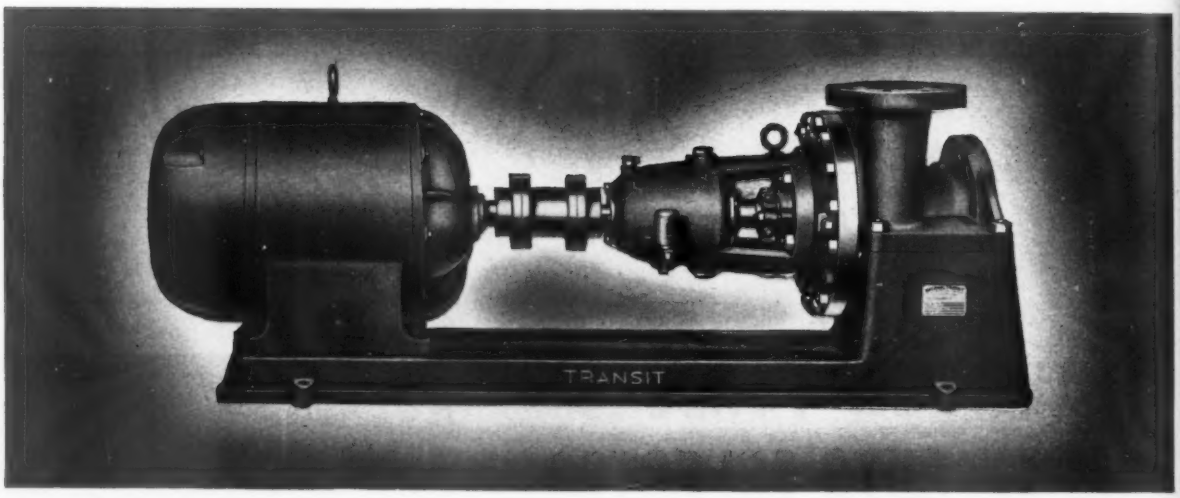
TRANSIT TYPE *ES* PROCESS CENTRIFUGALS

New 3 YEARS AGO - *Leading* TO-DAY

In toughest Refinery Services up to 900°F and 500 psi suction pressures.
82% of the original buyers have now placed additional orders.



Because they feature:

Lowest NPSH required with Impeller eye areas 15% larger and streamlined eye entrance.
Extra corrosion allowance and **smoother operation** with 3/16" greater case thickness.
Flatter performance curve for maximum operating efficiency over the capacity range.
Broadest range of head and capacity with the **highest interchangeability of parts.**
Latest developments in Mechanical Seal Design for higher dependability and simplicity.
Smoother running due to streamlining of impeller and volute and heavier bearing bracket.
Lowest maintenance. Parts subject to wear can be replaced in less time than in similar pumps.
Very latest proven design features of streamlined flow and mechanics which give greater dependability, lower maintenance and efficient operation at no higher cost.

Ask for Bulletin 6000.

For lower pressures, capacities and temperatures, ask for Bulletin 6100, Transit Type CS.

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PITTSBURGH, 912 Empire Bank Building • TULSA, 319 East Archer • LOS ANGELES, 2068 East 37th Street

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Cylindrical Plug gives full volume pipe flow

a.C.f. Cylindrical Plug Valves cut the man-waiting time of flow control in batch measuring. And on high volume flow, the exclusive straight-through, full pipe opening saves power. Any valve less efficient is more costly in the long run.

CYLINDRICAL a.C.f. FULL PIPE AREA LUBRICATED PLUG VALVES

Representatives in more than 50 principal cities.

Write for catalog 3-OG, showing types and sizes. American Car and Foundry Company, Valve Division, 30 Church Street, New York 8, N. Y.

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Wherever you see a heat exchanger here
G-R REBOILER
G-R TYPE FST EXCHANGER
G-R REBOILER
G-R TYPE B HEATER
G-R TYPE CBC HEATER
G-R TYPE FST COOLER
GRISCOM-RUSSELL • PIONEERS IN HEAT TRANSFER APPARATUS

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...it's a G-R unit

This Badger-built plant is a model of top-notch engineering and construction. To help make it so, G-R Exchangers, Coolers, Heaters and Reboilers are used, because of the proven excellence of G-R Heat Transfer Apparatus.

Here, as in other petroleum refining and chemical process plants all over the world, G-R Heat Transfer apparatus was selected to assure maximum effectiveness at minimum operating and maintenance cost.

G-R designs include bare tube and finned tube units for every heat transfer requirement, based on our unequalled specialized experience of more than 80 years. Each G-R unit has many exclusive and distinctive features which have been developed through continuous pioneering and which are unobtainable in other designs.

Write for bulletins describing heat transfer units in which you are interested, and be sure to consult the G-R engineers for your particular needs.

THE GRISCOM-RUSSELL CO.
285 MADISON AVE., NEW YORK 17, N. Y.

G-R TUBULAR EXCHANGER
A shell-and-tube unit with many distinctive features for efficient performance with minimum attendance and maintenance expense.

G-R REBOILER
Widely used in process industries, and available with either bare tubes or K-Fin helically finned elements.

G-R TYPE B HEATER
A simple, practical design, highly efficient on moderate pressure, moderate temperature duties.

GRISCOM-RUSSELL

GR-251

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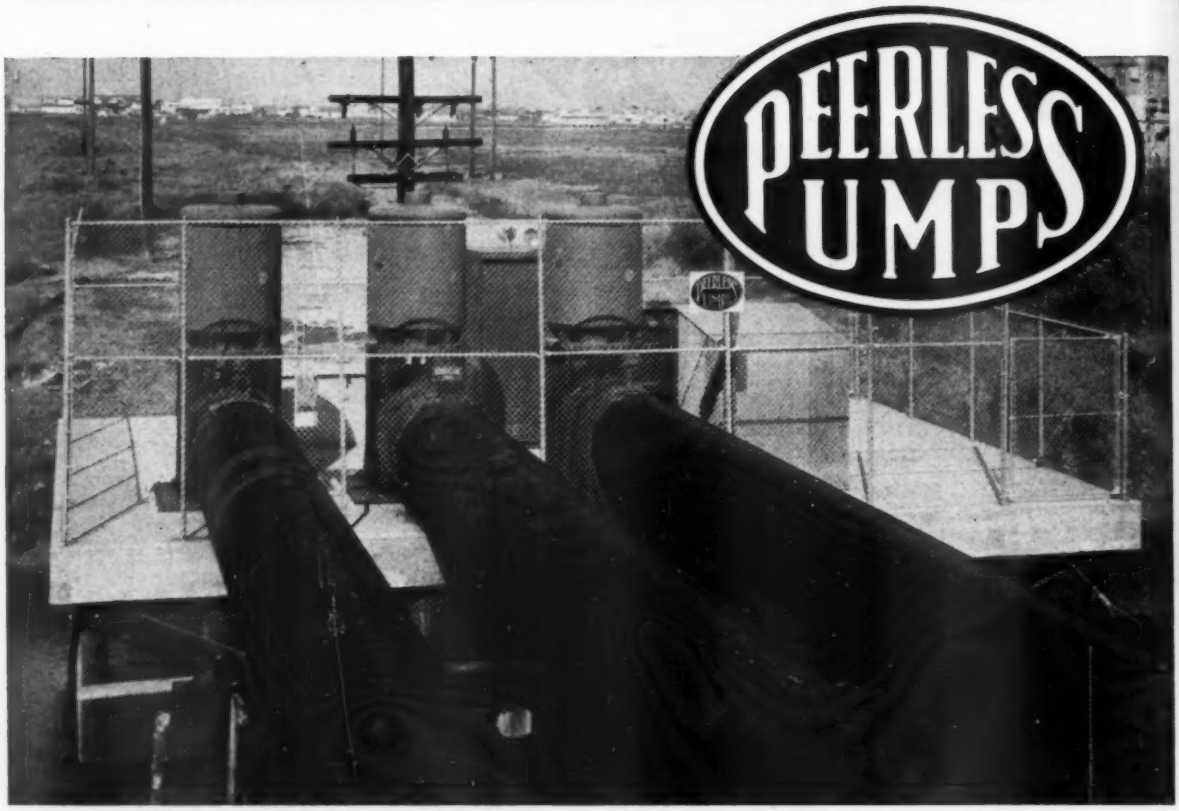
PEERLESS IN THE WORLD OF MOVING AND CONTROLLING WATER IN LARGE VOLUMES



PEERLESS HYDRO-FOIL PUMPS

OFFER CAPACITIES RANGING UP TO 220,000 G.P.M. AGAINST LOW AND MEDIUM HEADS FROM 2 TO 60 FEET

MIXED FLOW AND PROPELLER TYPES—The best way to move large quantities of water against low or moderate heads is to use Peerless Hydro-Foil Pumps. They're available in two types: propeller type and mixed flow type. Advanced principles of hydro-dynamics applied to the design of these versatile pumps insures lower overall maintenance outlay and reduced pumping costs, in all applications.

SINGLE AND MULTI-STAGE MIXED FLOW PUMPS—Peerless mixed flow pumps are made in single or multi-stage units to give flexibility in the selection of each pumping unit. These pumps complement the propeller type and embody advantageous characteristics of both axial-flow and centrifugal pumps. Designed for sump applications with minimum submergence, maximum heads, minimum installation space. Also available in close-coupled types.

ALL TYPES OF DRIVES—Any type of drive may be used with Peerless Hydro-Foil Pumps. These include: electric motor, right angle gear drive, V-belt and flat belt or a combination of drives, if required.

REQUEST 24-PAGE BULLETIN—For complete design, construction and application data including suggested station arrangements of these Peerless Hydro-Foil Pumps for economical, large-volume water pumping, request Bulletin B-148-1 now.

A FEW OF THE SERVICES AND APPLICATIONS OF THESE MULTI-PURPOSE PUMPS

- DRAINAGE
- FLOOD CONTROL
- CANAL DIVERSION
- DE-WATERING
- INDUSTRIAL AND PROCESSING APPLICATIONS
- CONDENSER COOLING
- IRRIGATION
- STORM WATER REMOVAL
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PEERLESS PUMPS fmc

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FOOD MACHINERY AND CHEMICAL CORPORATION
Factories: Los Angeles, California, and Indianapolis, Indiana
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"built like a Mack Truck"

● The expression "Built Like A Mack Truck" was not coined by us. It worked its way into America's everyday language because for 50 years Mack trucks have been an accepted symbol in the public mind for something extra strong and extra rugged.

To truck users in excavating and quarry work, in pit and strip mining, in oil field hauling — "Built Like A Mack Truck" means even more. It means trucks that are built to build profits... designed to give advantages offered by no other make. Powerful Thermodyne and diesel engines! Massive heat-treated frames! Rubber Shock Insulators! Hydraulic Power Steering! Air Assist Clutch! Mack's matchless Balanced Bogie and Power Divider.

All are Mack advantages that assure power and brawn for the heaviest loads... easy handling for fast loading and unloading... flotation and traction for the most slippery mud or sand.

Find out what "Built Like A Mack Truck" can mean on your particular job — in greater profits through greater output... greater economy.

Be Profit-Wise

Modernize with

Mack

...outlasts them all!

8018

Mack Trucks, Inc., Empire State Building, New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and distributors in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

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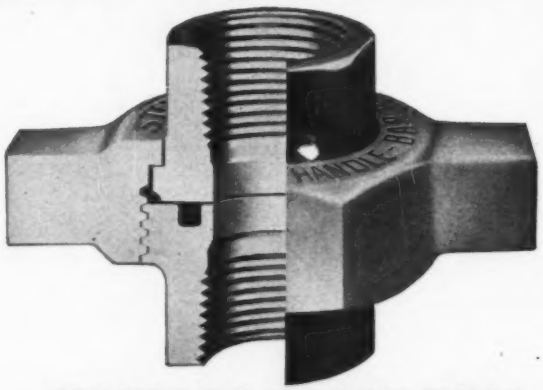
IT'S FASCINATING

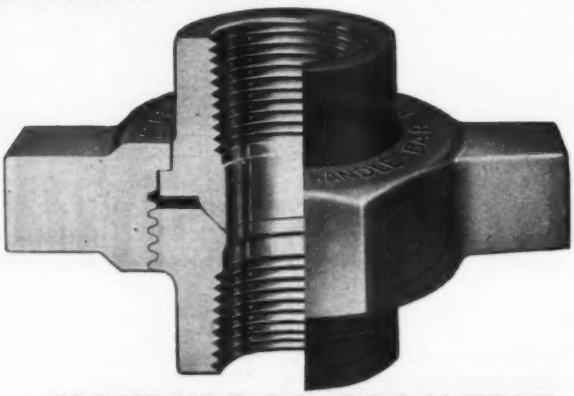
what a little "O" Ring will do in a Handle-Bar forged steel union



HANDLE-BAR "O" RING

REG. U.S. PAT. OFF.

Hand tighten the nut and the pressure from within the line makes the seal with the "O" Ring between the two mating surfaces. The one and only sealing method that does not require brute force to make a tight joint. Pressures to 3000 lbs. C.W.P. Temperatures to 212° F. Write for bulletin "O" RING HB.



HANDLE-BAR 4000 TEST

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4000 Test Handle-Bar steel to steel or bronze to bronze seats. Permanently lubricated nut threads. Pressures to 3000 lbs. C.W.P. Temperatures to 1000°. Use a hammer instead of a wrench to tighten or loosen the nut.

Write Dept. G for illustrated catalog or refer to listings in Composite Catalog pages 3082-3083, Chemical Engineering Catalog pages 980-981 and Refinery Catalog page 546.

ORDER BY TRADE NAME FROM YOUR LOCAL SUPPLY STORE

ORIGINATORS AND PIONEERS OF STEEL UNIONS SINCE 1912

CLAYTON MARK & COMPANY

1900 DEMPSTER STREET • EVANSTON, ILLINOIS

They Say—

Timely Suggestion

"It would be particularly healthful if some of those who are skeptical of competition in the oil industry would purchase a service station and meet that competition head on. It is neither a respecter of persons nor of big companies."

Editorial in The Link, Carter Oil Co.

Poor Reasoning

"The chief reason for the veto of the Kerr bill . . . was the fear that gas prices to the consumer would rise if the Government were prevented from regulating well-head prices.

"The fact is that the retail price index for gas in 1949, natural gas having been approximately 84 per cent of the total volume of all gas sold in that year, has risen less than 2.0 per cent from the 1935-1939 average, while the Department of Commerce all-commodity retail price index has increased 88 per cent during the same period.

"The well-head price of natural gas over the past 20 years, 1929 to 1949, has actually declined from 8.2 cents per thousand cubic feet to approximately 6.7 cents. It is difficult to accept the arguments made against the Kerr bill in the light of these facts."

Leonard F. McCollum, president, Continental Oil Co., addressing stockholders' meeting, Ponca City, Okla.

Governor's View

"I do not know what the State Department favors in the way of oil importations for international political reasons. Such reasons, supported by sober facts, ought to influence all of us, it seems to me, even though in a way it might affect our own personal pocketbook."

T. J. Mabry, governor of New Mexico, speaking in Santa Fe.

Sound the Alarm

"In response to the question so frequently asked by the business man, 'what can I do?' I would say: 'Tell the public the truth about business conditions. Stop playing a part in the conspiracy to fool the public. Tell them what you know to be a fact, that this prosperity is a phony; that it is supported by the legal counterfeiting of a progressive inflation; that business is being undermined because our national foundations of strength and security are being destroyed.'

"I do not suggest that the telling of this tragic truth by the American business man will save the situation.

PROTECT or PAY

You have no other choice!

There are just two reasons why corrosion costs industry over $6,000,000,000 annually:

1. To the layman, corrosion usually means only visible rust—thus many surfaces are left unprotected until irreparable damage is done.
2. Too often conventional coatings are relied on to protect under conditions for which they are neither designed nor suited.

Don't risk needless loss from either cause. Protect all critical surfaces with Amercoat – the products designed to give *extra protection* against surface failure. Highly resistant to a wide variety of chemicals, brines, fumes, weathering and abrasion, they are available in a number of formulas, each built to meet specific conditions.

No business escapes the effects of corrosion. You must protect or pay, and it will pay you to protect *now* with Amercoat.

Check these danger points...

Piping • Machinery
Walls and Ceilings
Fixtures • Tanks
Floors • Conveyors
Laboratory Equipment
. . . and all other areas exposed to agents of corrosion or contamination

AMERCOAT CORPORATION

A Division of
American Pipe and Construction Co.
4809 Firestone Blvd., South Gate, California

FOLLOW THE LINE OF *most* RESISTANCE

JUNKED BEFORE ITS TIME–

This costly storage tank, due to failure of a conventional coating, served but half its life expectancy. The result—thousands of dollars for replacement, interrupted operations and needless waste.

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Hair-trigger acceleration plus plenty of lugging power means faster round trips!

1200 HP at work for Geier-Jackson, Inc. drilling the Montgomery No. 1, 15 miles southwest of Ozona, Texas.

— that's why the 600 hp Le Roi L3460 cuts deep-hole drilling costs

WHEN it comes to hoisting, you can't beat the wide range of speed and flashing acceleration of the Le Roi L3460. The L3460 with its modern integral V-12 construction guarantees you better than 500 hp at 1350 rpm — more power than any other engine of its kind.

And for mud-pump service the L3460 delivers ample power — from 225 hp at 900 rpm to 450 hp at 1200 rpm. You can count on extra-long engine life at these conservative continuous-service speeds.

Le Roi's V-12 design is unquestionably the answer to demands for greater horsepower and quicker acceleration in a single, compact portable unit. Easy to service. Operates on oil-field fuels — natural gas, butane, or gasoline. See your Le Roi distributors for complete details.

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Le Roi-Rix Machinery Co. — Los Angeles, Long Beach and Bakersfield, Calif.

Appalachian Area
P. C. McKenzie Co., Pittsburgh

Canada
Lucey Export Ltd. — Calgary, Edmonton, Alberta.

Complete Sales and Service Facilities

P-101

but it is certain that until and unless he removes the curtain of false optimism. there is no chance of reaching the public with the facts. Ours is a primary responsibility of sounding the alarm."

W. C. Mullendore, president, Southern California Edison Co., speaking in Los Angeles.

Happy Reader

Sir:

All of us in Transcontinental are delighted with the special edition of The Oil and Gas Journal dated May 4. We may be prejudiced when we say we believe this is one of the outstanding features the Journal has ever printed. . . .

Curtis Morris, vice president, Transcontinental Gas Pipe Line Corp., Houston.

No Crude-Price Cut

"As a result of reduced inventories and improved strength in product prices, the crude-price outlook is most satisfying, and there seems small likelihood of any price cuts. This situation is in striking contrast to the fear and uncertainty which existed throughout 1949 and the early part of 1950."

Walter S. Hallanan, president, addressing annual meeting of Plymouth Oil Co. stockholders, Pittsburgh.

Growing Aromatics Need

"To improve present-day high-octane gasolines — the best ever produced—refineries are constantly seeking better methods to obtain the maximum precentage of aromatic hydrocarbons from each barrel of crude oil. The trend is definitely toward aromatics, even though they are expensive to make."

Fred Preu, assistant manager, Shell Oil Co.'s special-products department, addressing American Coke and Chemicals Institute, Rye, N. Y.

Oil and the Next War

"It would appear . . . that, were we so unfortunate to become involved in another war, every last drop of oil that this hemisphere could produce would be required. Again this nation and this hemisphere may be called upon to fuel the war effort. Therefore, the petroleum industry of the Western Hemisphere must be kept healthy. By a healthy industry, I mean an industry that is continually on the search for new reserves and is drilling them. Oil that has not been reached by the drill is not a military asset and will probably be useless in an emergency.

"Some may say, 'We have today approximately one million barrels per day of excess productive capacity and that, plus the quantity to be saved by civilian rationing, should carry us

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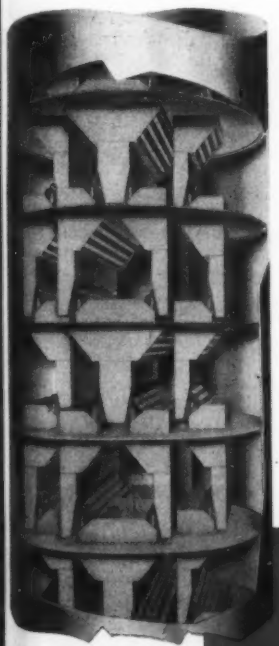

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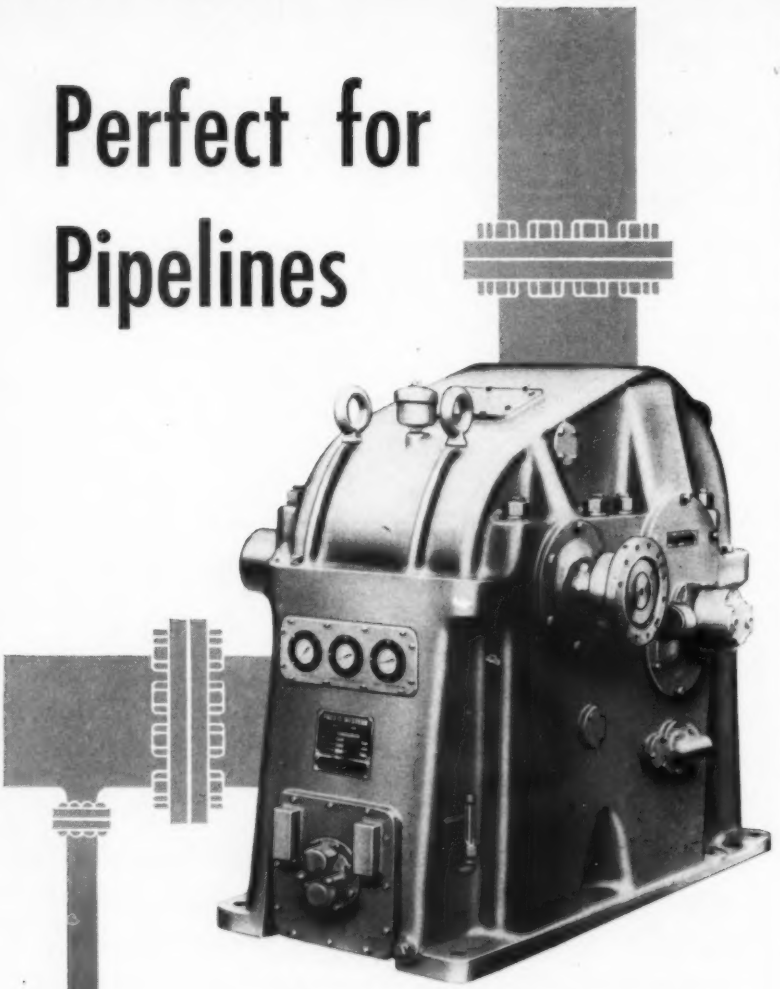

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through in the event of war.' It is true that a parallel set of conditions carried us through World War II, but let us not lose sight of the fact that conditions have changed."

Rear Admiral Burton B. Biggs, executive secretary of the Munitions Board, before a meeting of producers in Clarksburg, W. Va.

Dangerous Operation

"Statistically-minded theorists have sought to create, in the world of business, a class distinction that never has existed and that never can exist. They have arbitrarily drawn a wholly imaginary line through all of American industry and they declare that everything on one side of the line is small business while everything on the other is big business....

"Now every practical businessman in America today knows that such a concept is ridiculous. The American industrial machine is a unit, just like an automobile. It is made up of big parts and little parts, each of which does its own particular job and all of which are intricately fitted together. You may think that it would be fun to sort them all out into neat piles according to size to please the statisticians. You could even pass a law declaring that all the parts must be the same size; and the theorists, no doubt, would be delighted. But when you get through, your automobile won't run — and neither will American industry."

Benjamin Fairless, president, United States Steel Corp., speaking in Washington.

Kept Promise

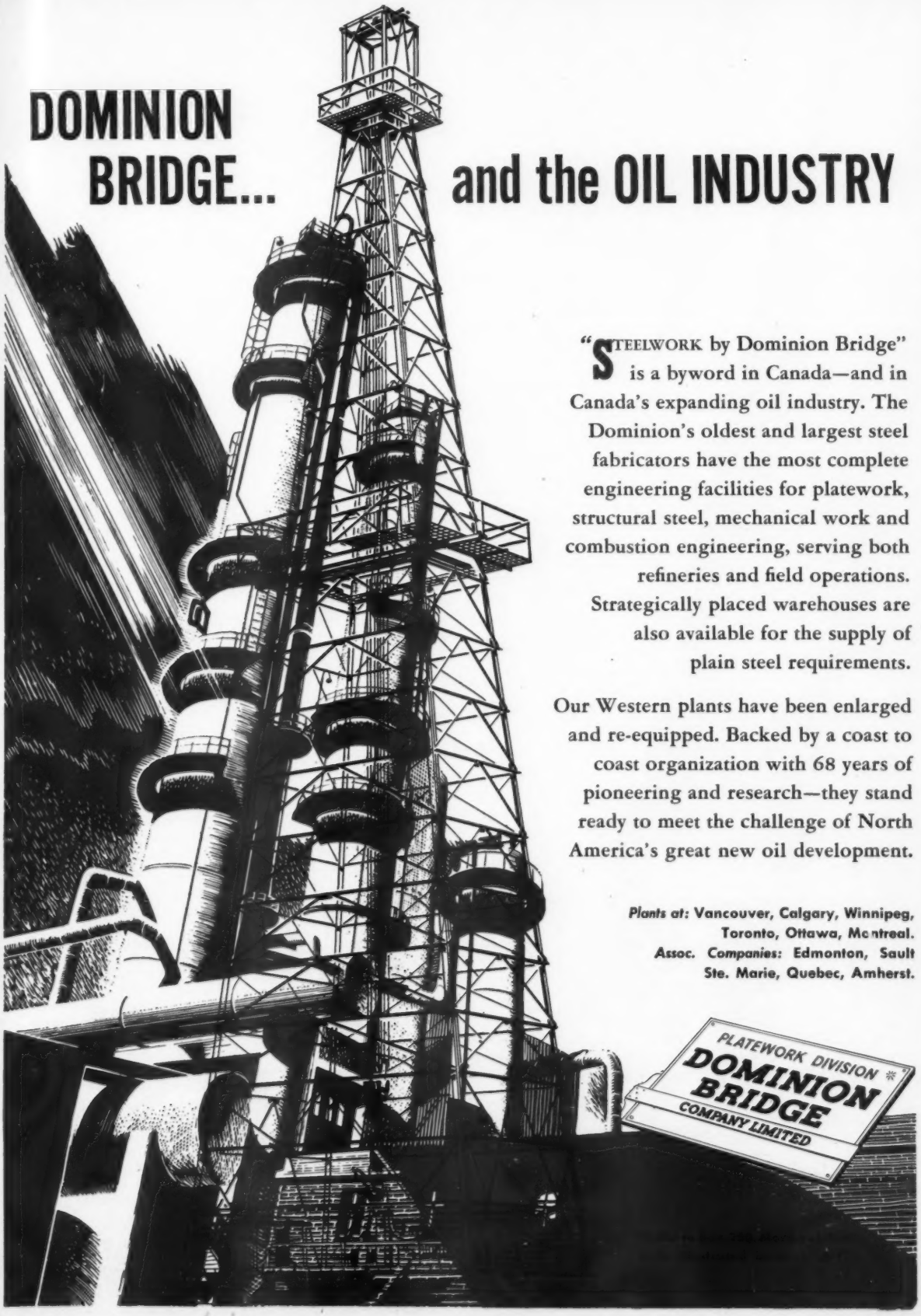
"Last year—1949—the oil men of this country drilled more than 39,000 holes right here in the United States. Do you realize how much mud and rock they had to drill through to do that? Nearly 138 million feet—more than three times the diameter of the earth.

"Twenty-two thousand of those holes proved to be oil wells. Nearly 3,000 proved to be gas wells. And the dry holes? Well, there were almost 13,000 of them. And the cost? Well, drilling a hole runs from $25,000 to a million dollars. The average is impossible to estimate but let's take $40,000. The score? One billion and a half dollars.

"That's how much it cost the oil industry last year to keep its faith with the American people. But it kept it. It found far more oil than the nation needs. It's doing the same thing this year. And if my experience and knowledge of the industry means anything, it intends to keep right on doing it."

John M. Lovejoy, president, Seaboard Oil Co. of Delaware, addressing Highway Transportation Congress and National Highway Users Conference, Inc.

DOMINION BRIDGE... and the OIL INDUSTRY



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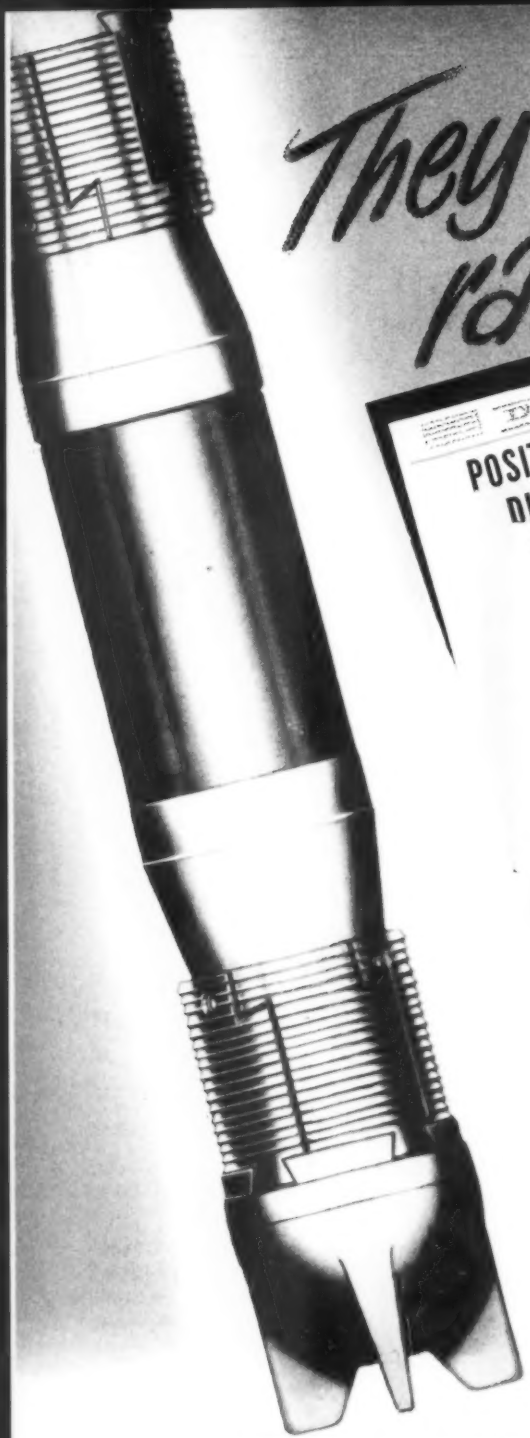

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JOURNALLY Speaking

Retort Courteous

OUR engineering writers aren't the only ones who have trouble translating technical jargon into the every-day language of the plain, ordinary oil man.

Bert Linz, our demon Washington editor, is up against the same thing with government gobbledegook. The other day in trying to figure out the final language of a bill he ran across this in a conferee's report:

"Amendment numbered 2: That the Senate recede from its disagreement to the amendment of the House numbered 2, and agree to the same with an amendment as follows: Omit the matter proposed to be inserted by the House amendment; and that the House agree to the same."

Being wise in the ways of congressional c o u r t e s y, Bert knew that this simply meant that for a second time the Senate refused to accept a House amendment.

Applied Cybernetics

NOT long ago this department disclosed its ignorance in discussing the science of cybernetics (thinking machines) by suggesting that somebody ought to invent a machine that would do an oil man's thinking for him.

We have had our come-uppance already. It has been pointed out to us that electronic computers are being used to analyze data on oil reservoirs to determine the best drilling pattern and production rate, that at least one of these intricate gadgets is at work right in Tulsa, and that our favorite oil publication has printed pictures and descriptions of the apparatus.

From another source comes the information that Northwestern University has applied cybernetics to refinery design and operation. It has a thinking machine described as composed of resistors, potentiometers, and amplifiers, for predetermining the performance of multicomponent fractionating towers. This handy gismo, it is said, will tell what sort of equipment should be built to yield desired chemical products and also how to set the dials and valves to get a different yield from plants already in operation.

All of which proves that you have to get up early in the morning to be ahead of the oil industry. But so far, alas, nobody has called our attention to any practical application of cybernetics to the editing business. We're still pounding out copy the hard way.

The Stem

THE flurry in Scurry last week was not a new reef discovery but an invasion by the Journal's advertising men—the whole crew listed in the column on the left of this page. They had been holding their annual conference in the home office, absorbing sales vitamins from the wellspring of oil-industry information.

Then they took off in a body for Scurry County to see for themselves what has been causing all the excitement there. That these fellows are good salesmen can be deduced by thumbing any issue of our favorite oil publication, but except for their mentor, "Mitch" Tucker, none is a petroleum engineer, and the boys in the eastern offices seldom get within spitting distance of an oil well. So they took along a bevy of our engineering writers to point out the actual installations in refineries, gasoline plants, pipe lines, and drilling rigs of the various pieces of equipment their clients advertise.

Of course our men don't write the advertisements, but these annual field trips enable them to point out to manufacturers how they can best present their equipment to the men who use it. Their success reminds us of the gag about the fellow in the bar who ate the cocktail glasses and threw away the stems, much to the disgust of the bartender who claimed that the stem is the best part.

It's no compliment to the editors, but many of our readers say the ads are the best part of our book.

—*Henry D. Ralph*

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NO OTHER EQUIPMENT—no other method of cementing—provides such assurance of successful "first-time" cementing as the exclusive Baker Principle of *whirling* the cement up and around the casing which is effectively centered in the well with BAKER MODEL "G" CASING CENTRALIZERS.

Not only can you REMOVE BRIDGES which might stick the casing; not only can you wash the wall of the hole to help REMOVE MUD CAKE and leave the formation prepared for effective bonding with the cement to follow, but the *downward*, then *upward* ***whirling*** motion of the cement slurry REDUCES THE HAZARD OF CHANNELING TO A MINIMUM, and assures COMPLETE ENCASEMENT OF THE CENTERED CASING at the critical shoe joint with a uniform body of cement.

RESULTS ARE WHAT REALLY COUNT

When you use Baker Cement Equipment you *know* that the buoyant ball will seal against the resilient rubber ring (backed by sturdy interior construction) to provide a leak-proof back-pressure valve for floating those long, heavy strings of casing, and to seal instantly at the slightest reversal of pressure and prevent any return flow of the cement slurry. You *know* you will secure maximum cementing efficiency by the ***whirling*** cement slurry, combined with complete drillability. And you will enjoy that peace of mind which comes from using equipment of PROVEN DEPENDABILITY with a record of successful performance in thousands of wells under every imaginable condition.

You are assured of RESULTS when you use Baker Hook-Ups as pictured at right using a BAKER WASH-DOWN WHIRLER GUIDE SHOE (Product No. 121) with BAKER MODEL "G" CASING CENTRALIZERS spaced throughout the cementing area to provide *maximum centering force at the critical cementing point.* Then, with a BAKER CEMENT FLOAT COLLAR (Product No. 101 M & F) positioned a joint or two above the shoe, you have the world's best "float valve" for safety, plus a "stop" for the cementing plug so that cement tailings are retained inside of the casing.

For deeper wells, where maximum "floating strength" is a worthwhile precaution, a Baker Cement Wash-Down Whirler Float Shoe (Product No. 120) used on the bottom of the string will give you double safety at negligible extra cost.

Call the nearest Baker representative or office. Find out how dealing at Cementing Headquarters means SUPERIOR RESULTS FOR YOU.

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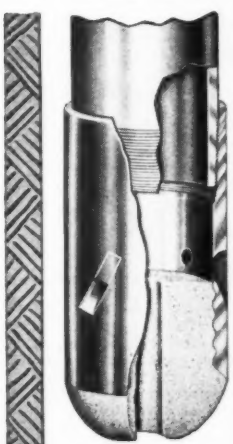
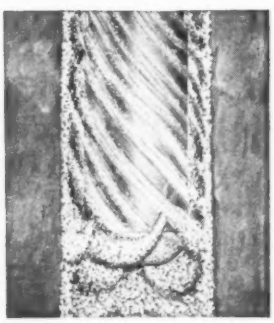


Here is visual proof of what *whirling* does for you...

The downward hydraulicking action of the circulating fluid through the baffled side down-whirler ports and the restricted bottom passageway, effectively remove bridges and permits safe running of the string of casing.

When washing the formation at the cementing point to condition the hole, the "whirling" motion of the fluid helps remove mud cake from side walls. This *downward* whirling is far superior to any *side jetting* action, and does not cause caving or crumbling of soft formations.



The "whirling" motion given to the cement slurry as it is discharged from a Baker Wash-Down Whirler Shoe causes the cement to encase the centered shoe joint with a more uniform body of cement, and reduces to a minimum the hazard of channeling.

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The Yardstick Supplied

The information made available at the Texas Railroad Commission hearing last week should aid materially in establishing a sound basis for both domestic and foreign operations over the remainder of the year.

There was a recognition on the part of importers that their shipments from foreign fields and refineries could be expanded to the point where they would become controlling in domestic markets. They denied that had happened up to now and at the same time there were no indications that they felt that the in-shipments should be lowered generally.

There were no substantial differences of opinion among most operators at Austin as to the desirable inventory levels for crude oil and products to take care of seasonal consumption over the next several months. As to the future, there is much more flexibility in well production and in plant and transportation capacity than there was 1 to 4 years ago, a fact which should be taken into consideration in determining output and stock needs.

Assuming the continuance of imports at present levels it is apparent that upon domestic operators rests the responsibility of maintaining future supplies in line with needs.

It is agreed that demands, which have been greater so far this year than was expected, will show substantial gains over the next 7 months. But with imports running ahead of the corresponding period in 1949, the need for expansion in domestic output will be smaller than gains in total demands.

Unwarranted increases in domestic allowables will bring about market conditions comparable to those which materialized last fall when domestic output was increased following a period of curtailments. The enlarged supplies were not needed at that time and markets reflected that fact.

When this situation was recognized early this year and the needed action taken, the market structure strengthened and that trend continues to this time. Refinery realizations, which were unsatisfactory to most operators last year, have improved in recent weeks.

The immediate objective should be to bring these plant realizations in line with crude-oil price schedules so that refiners also can view the future with confidence. Otherwise there can be no permanent stability in the industry as a unit.

Increases in allowables in one or more states, until justified by actual demands, will jeopardize the gains already made this year and necessitate another prolonged adjustment period.

It is the duty of the domestic oil business, with due regard to the conservation of the nation's most valuable mineral resource, to see that every petroleum demand is satisfied. The Austin hearing gave the domestic industry the needed yardstick to guide its activities. It remains to be seen how effectively operators and state conservation bodies will use it.

XUM

THIS WEEK

WASHINGTON—Depletion allowance appears safe as House ways and means committee votes to retain 27½ per cent allowance for oil and gas producers. . . . ¶Judiciary committee reports out bill to confirm state title to offshore oil. . . . Further action may be postponed until Supreme Court acts on tidelands cases and furor over gas legislation quiets down. . . . ¶Senate committee castigates RFC for making Texmass oil loan. . . .

INVESTIGATIONS—Senate labor committee launches probe of effect of oil imports on employment in petroleum, coal, and railroad industries. . . . ¶FTC asks appropriation to make sweeping investigation of all sorts of complaints against oil industry, saying many ills result from integration and "follow the leader" marketing practices. . . . ¶House small-business committee may investigate FTC's investigations. . . . ¶Federal judge slaps Justice Department for indicting corporations. . . .

SUPPLY—Imports will remain at about present levels remainder of 1950. . . . Anticipated daily averages: 500,000 bbl. crude, 300,000 bbl. products. . . . Major importers say commitments can't be altered, East Coast must have foreign fuel oil. . . . ¶Texas will have 18 producing days in June. . . . Expected to produce 2,366,376 bbl. of crude daily, an increase of 140,000 over May. . . . ¶Major companies see no need for drastic changes in stock levels. . . .

TRENDS—Indicated demand for gasoline at refineries for 4-week period ended May 13 was 6.5 per cent greater than in same weeks last year. . . . Current gasoline demand is greater than midseason demand in 1949. . . . ¶Gasoline stocks east of California are only 757,000 bbl. greater than last year. . . .

ACTIVITY—Crude production averaged 5,053,450 bbl. daily for week ended May 20, up 8,125 bbl. daily from previous week and 134,950 bbl. daily from same week last year. . . . ¶Well completions were up 3 wells from previous week to 845, or 52 wells more than same week in 1949. . . . Wildcat completions totaled 135 wells for the week. . . . ¶Rotary rigs operating in United States on May 15 totaled 2,056, off 16 rigs from previous week but 8 more than a year ago. . . .

INTERNATIONAL—Foreign crude production hit new record in March. . . . 17 per cent over year ago. . . . More than offsets drop in U. S. output. . . . ¶Italy's AGIP planning rapid development of oil and gas discoveries in Cortemaggoire area of Po Valley. . . . Building large natural-gasoline plant, gas trunk lines to Genoa and Turin. . . . Has 12 drilling rigs, 6 seismic crews working. . . . ¶Pemex says early completion of Salamanca refinery and new pipe lines will solve Mexico's distribution problems. . . . ¶I.P.C. and Iraq Government fail to agree on new concession terms. . . .

NATURAL GAS—Independent producers and gatherers still in dark as to how far and when FPC may proceed against them now that Kerr bill is dead. . . . ¶Alberta's gas reserves said to be adequate for provincial needs, eastward line to Winnipeg, and westward line to Vancouver and U. S. Northwest. . . . ¶Two firms plan large underground-storage projects in western Pennsylvania.

PIPE LINES—Great Lakes nearing completion of expansion projects which will move greatly increased volumes of Mid-Continent products to north-central consuming areas. . . . ¶Penn-York company plans independent, common-carrier products line from New York-Philadelphia refining areas to Rochester, N. Y. . . . ¶Phillips plans 281-mile, 10-in. crude line from Borger, Tex., to Yale, Okla., closing gap in system to move West Texas crude to Kansas City refinery. . . .

OPEN FOR BUSINESS.—General offices of the Royal Dutch-Shell group in Venezuela are now housed in this ultra modern new office building in San Bernardino, a suburb of Caracas. Housing 850 employes, which is only 4 per cent of Shell employes in Venezuela, the new building has its own water and power systems.

Imports Rebuttal

Company executives tell Railroad Commission little change expected in present level, say domestic industry not hurt

Roy F. Carlson

AUSTIN.—Imports will remain at approximately present levels at least through 1950, according to testimony before the Texas Railroad Commission by the heads of major oil-importing companies.

The company executives appeared at the commission's allowable hearing in response to a request of two commission members that they personally be present to explain their 1950 import plans.

While forecasting no drop in imports, the oil-company officials asked that Texas production be increased, citing the recent downward trend in stocks of crude and finished products and forecasts of increased demand. (See Southwest.)

The importing-company officials indicated that, to a large degree, the present imports rate is fixed by contractual commitments made during the postwar period of short supply and high demand.

They also told the commission that their estimates were based on totals—crude and products—and were unusually high for the first quarter of 1950 because of large imports of residual fuel, brought into the country to offset a cold spring and to replace supplies of coal that were unavailable during the recent strike.

This residual fuel, they indicated, was largely unavailable from domestic supplies and foreign sources were the only resource left to the companies to satisfy consumer demands.

Further, they said, much of the crude imported is specialty crude oil for the manufacture of road oils or heavy fuel.

Table 1 summarizes the imports schedules of the companies submitting data to the commission, together with an assumed forecast for other companies calculated on the difference between reports of the 12 reporting companies and total imports as shown by the Department of Commerce.

Gulf Oil Corp.—S. A. Swensrud, president of Gulf Oil Corp., termed the residual-fuel situation as a temporary "bulge" that should not be looked on as indicating a permanent trend toward increasing import levels.

Swensrud, as did several of the other officials, referred the commission to the crude-supply situation 2 years ago. Then, he said, in answer to pleas from Government and industry, crude and products were made available but it was at the time necessary to contract for large import supplies of both.

Atlantic Refining Co.—In the same vein R. H. Colley, Atlantic Refining Co. head, explained that from 1946 to 1948 the federal Government encouraged foreign exploration and Atlantic made heavy investments in Venezuela.

At the same time, during the short-supply period, several of Atlantic's crude-supply connections were severed by suppliers who were selling crude at a premium. It was then that Atlantic entered into long-term contracts with foreign producers so that they could supply domestic consumers with fuel oil.

At the same time Atlantic ordered three new tankers that are to be delivered this year, and at full-time operation will bring in an average of 12,000 bbl. per day of petroleum.

Standard Oil Co. of California.—R. G. Follis, chairman of the board of Standard Oil Co. of California, also defended his company's imports vigorously. His company exports 43,000 bbl. per day, excluding shipments to Alaska and Hawaii, which is 10,000 bbl. more than it imports.

If imports were curtailed, he said, "the advantages desired from such a step by the domestic producers would be largely nullified in our case because the pressure to preserve American-owned foreign concessions would tend to force the use of these crudes to supply the export market directly. Furthermore, any shift in this direction would be most undesirable from the viewpoint of the domestic refining industry."

"We believe," Follis said, "that imports should not be restricted by legislative action unless there is evidence that the industry is no longer able to carry on the vigorous and aggressive program of exploration and development which is necessary if it is to meet the nation's requirements in peace or war."

To show that the industry was vigorous, Follis then quoted Railroad Commission statistics that showed that during 1950 through May 6, oil fields discovered had increased by 23 per cent, oil-well completions had increased by 19 per cent, and the number of drilling applications had increased by 24 per cent over the same period in 1949.

He then added: "It has now been well over a year since your commission started to reduce allowable production, and it would appear that ample time has elapsed to determine whether incentive to explore and drill for oil have been diminished as a result of imports. The fact that exploration and drilling have increased by the considerable percentages shown above refutes the arguments of those who have been insisting that such activity has been dangerously curtailed."

Follis described the growth of Standard Oil Co. of Texas, a California Standard subsidiary, to show that the oil industry was thriving in the atmosphere of "high imports. He added that "on the other hand, over the past few years our expenditures in Venezuela have decreased from $26 million in 1948 to $17 million in 1949, and to $6 million this year."

"Likewise," he said, "the capital expenditures and employment of our Middle East affiliates have declined sharply."

Standard Oil Co. (N. J.)—Eugene Holman, president of Standard Oil Co. (N. J.), also defended his company's imports. He took issue with a statement in the telegram sent by the Railroad Commission to the company heads requesting their presence at the meeting. The telegram stated that Texas was losing $19 million of revenues because of imports.

Holman said Jersey Standard is

TABLE 1—IMPORTS
(Barrels daily)

	First quarter, 1950			Last half, 1950		
	Crude	Products	Total	Crude	Products	Total
Standard of California	33,000	.....	33,000	33,000	.....	33,000
Standard of Indiana	10,000	*34,000	10,000	10,000	*34,000	10,000
Atlantic Refining Co.	55,000	.....	55,000	62,500	.....	62,500
Cities Service Co.	7,000	1,700	8,700	6,000	2,000	8,000
Gulf Oil Corp.	105,000	.....	105,000	105,000	.....	105,000
Shell Oil Co.	8,000	.....	8,000	8,000	.....	8,000
Asiatic Petroleum	.....	94,000	94,000	.....	90,000	90,000
Sinclair Oil Corp.	34,000	.....	34,000	48,500	.....	48,500
Socony-Vacuum Oil Co.	68,000	.....	68,000	69,000	3,750	72,750
Standard Oil Co. (N. J.)	75,663	182,578	258,241	75,000	151,500	226,500
Sun Oil Co.	8,000	.....	8,000	7,500	.....	7,500
The Texas Co.	68,000	7,000	75,000	63,000	3,000	66,000
Other imports	10,037	58,622	68,659	†10,000	†58,600	†68,600
Total	481,700	343,900	‡825,600	497,500	308,850	806,350

*Purchased from East Coast supplier. Not included in totals. †Other imports included at first quarter rate. ‡Total imports from Department of Commerce.

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TABLE 2
(Thousands of barrels daily)

	Year 1948	Year 1949	Change
Crude-oil production:			
District 1	55	52	— 3
District 2	998	978	— 20
District 4	219	221	+ 2
District 3 other than Texas	840	841	+ 1
Texas	2,468	2,038	—430
Total Districts 1-4	4,580	4,130	—450
Loss of domestic crude-oil outlet:			
Total demand for crude and products	5,189	5,209	+ 20
Crude-oil production	4,580	4,130	—450
Loss of domestic crude-oil outlet	.....	.....	470
Increases in other sources of supply:			
Draft from crude and product inventories	+247	—57	304
Imports of crude	353	422	69
Imports of products	159	216	57
Receipts from District 5	18	30	12
Natural-gas liquids	326	354	28
Total	.....	.....	470

against flooding this country with foreign oil, and added: "Accordingly, we believe that imports of crude and products into the United States should always be considered in relation to their effect upon the long-range preservation of the national security, the welfare of the American consumer and the domestic industry, and the sound growth of international trade."

He then reviewed Jersey Standard's imports history and showed that crude-oil imports had dropped from 160,000 bbl. per day in 1949 to 75,000 bbl. at present.

He estimated that during 1950 there will be an increase in demand of 400,000 bbl. daily and stated: "Even so, we do not expect crude-oil imports by our affiliates to increase above the 75,000-bbl. per day average, which, in accordance with our message to the House small-business committee last January, has been maintained since early this year and is being maintained now."

Holman then made a detailed explanation of the how and why of heavy imports of residual fuels. "It is clear," he said, "that the bulk of the domestic residual-fuel supplies (84 per cent east of the Rockies) has come from domestic sources—and still does.

"As we have explained a number of times in the recent past, it is our conviction that under the program which our affiliates follow, their imports of residual fuel oils are necessary to supplement the domestic supply. During March of this year the weather along the East Coast was colder than normal. Coal supplies were running out. There was nothing to fill the gap except additional heavy-fuel-oil supplies. There was, therefore, a sharp increase in the demand for residual fuel and, since protection of consumers' needs is one of our primary considerations, our affiliates increased residual imports to meet those needs.

"The colder-than-normal weather persisted through April, coal was still short, and residual-fuel imports had to continue at only slightly less than the March level. As many of you know, residual-fuel stocks throughout the United States in April 1950 were about 17 million barrels lower than they were in April 1949—a reduction of almost one-third. They are still only at a minimum working level. If the needs of customers were to be met—if a fuel crisis on the East Coast were to be avoided—we had no choice but to import.

"We cannot meet our total demand for fuel oil from domestic supply sources today, simply because heavy fuel oil cannot be made economically from domestic crude except on a by-product basis. Production of residual fuel oil in amounts greater than those available as a byproduct means deliberate down-grading of higher-valued crude oil to lower-valued fuel oil, the value of which is set at a level below that of crude oil by competition with other sources of energy, chiefly coal. In this situation, the alternatives to the refiner would be either to accept heavy losses or deliberately to give up business to coal. In either case, the domestic oil producer would gain little or no volume and the consumer would lose much.

"Nevertheless, in considering oil-import statistics most people treat imports of crude and of residual fuel oil as a single total. This practice naturally swells the import figure and thus can be misleading.

"Our company," Holman said, "has a great stake in the domestic economy. Our firmly stated policy is to take no action that is not in the long-range interest of the consumer, the general public, and the domestic industry—and believe me, gentlemen, we do not consider that we have departed from that policy, nor do we intend to."

With regard to Texas' loss of $19 million in revenue due to oil imports, Holman said that his information indicated that figure as being conservative, but he stated that imports should not take all the blame. He introduced statistics to show other losses of crude outlets. He showed that crude-oil production was down 450,000 bbl. daily east of the Rockies and then gave the data shown in Table 2.

Shell Oil Co.—H. S. M. Burns, Shell Oil Co. president, testified that imports helped avert a fuel-oil crisis on the East Coast during recent fuel shortages. He added that Shell's imports, now at 8,000 bbl. daily, are blt 2.7 per cent of its refinery runs. He reiterated the statements of others that imports met an industry demand that could not have been met by domestic production. Asiatic Petroleum Co., a Shell affiliate, imports about 94,000 bbl. at present, this quantity to be cut to about 90,000 for the remainder of the year.

Cities Service Oil Co.—Imports by Cities Service subsidiaries during 1950 are to be less than for any year since 1945 according to B. S. Watson, vice president.

Pricing Criticism

Blazer recommends "market leader" system be dropped

Dahl M. Duff

NEW YORK.—Abandonment by the oil industry of the "market leader" pricing system under which other suppliers immediately follow the price changes of a major seller was advocated by Paul G. Blazer, chairman, Ashland Oil & Refining Co., at the Empire State Petroleum Association meeting here last week.

He contended the system gives the public the impression one or two companies "run the whole show" and makes the industry a target of suspicion with the antitrust division of the Department of Justice.

Blazer held it would be better for a company to lose a few customers to competitors rather than to blindly follow the price moves of an important marketer. Although price cutting should be supported by low costs and financial strength, the price cutters are the industry's best protection against governmental investigation, he said.

In the petroleum industry, Blazer said, uniformity of pricing results not from collusion but from a "foolish competitive fear" of the results from lower prices of another company. Announcement of price changes, he said, make the public conscious of the price, and where all other companies immediately follow an uneconomic price reduction, the public gets the idea the normal price must have been too high in the first place.

On the subject of imports, the Ashland official said he felt strict control by the government would cost the public a good deal of money and result in a higher crude price over a period of time. In this connection, the New York marketing association at its annual meeting voted a resolution

opposing any further restrictions or higher duties on imports on the part of the federal Government.

Blazer, in his discussion at the meeting, touched briefly on the problem of disposal of any oil that may be produced in the Neutral Zone of the Middle East by American Independent Oil Co. in which Ashland is a stockholder. He conceded the marketing of this oil would be difficult, and said that the entire question depended on the currency situation. He was optimistic that the British Government will make concessions.

The New York association meeting this year centered largely on the theme of vigorous promotion of oil heat to meet the threat of natural-gas competition in the East. Speakers described this fight as one of independent small business aligned against government-regulated gas monopolies.

Unanswered Question

No one knows how far FPC may go in trying to control independent producers and fixing field prices of gas

Henry D. Ralph

"WHAT should an independent gas producer do now that the Kerr bill has been vetoed?"

That question has been asked of The Oil and Gas Journal by a number of producers who apparently are under the impression that the veto of the bill immediately subjected them to regulation by the Federal Power Commission.

A short answer is: Do nothing until the FPC issues an order against you. Nothing, that is, except to be on guard and continue to support efforts to clarify the commission's authority by legislation or court action.

Actually the FPC has not attempted to exercise any control over an independent producer or gatherer of natural gas selling to an interstate pipe line. There are no regulations applying to him, nothing that he must do or refrain from doing. All he needs to do is sit and wait—and fear.

It is the fear of possible regulation which has caused all the controversy over the Kerr bill and its predecessors, the Risley, Priest and many other bills seeking to write a specific definition of the FPC authority over producers.

How it started.—And all this fear and the resulting hullabaloo in Congress and throughout the country arose from one question asked of a witness in court 4 years ago. The question was not answered then and it has not been answered since.

The question was: "If the position of the Federal Power Commission is carried to its logical conclusion, would not even an individual producing from a single well, knowing that his gas is destined for interstate commerce, be subject to FPC jurisdiction?"

The witness was the chief counsel for the Federal Power Commission. He was arguing a case before the United States Court of Appeals for the Fifth Circuit, and was asked that question from the bench. He refused to answer.

That was the case of Interstate Natural Gas Co., Inc., the famous case which is frequently cited as the cause of all the fear and controversy.

The Interstate company already owned an interstate pipe line and therefore was a "natural gas company" as defined in the law and subject to FPC regulation. There was no argument about this phase. But in this particular case Interstate did something which it thought was outside of FPC jurisdiction.

What it did was make arm's-length sales of some of its own gas and some gas purchased from independents in Monroe field, Louisiana, to three other interstate pipe-line companies with which it had no financial ties. In doing this it thought it was acting in the capacity of an independent producer and gatherer of natural gas, which everyone thought until then, was specifically exempt from regulation by the language of the Natural Gas Act.

But the Federal Power Commission ordered Interstate to charge no more than 4.66 cents per thousand cubic feet for gas it sold to the three other lines. Actually the company paid an average of 5.5 cents for this gas and spent 1.1 cents in gathering it, and it had contracted to sell the gas at 7.39 cents per thousand.

So the FPC order caused the company an out-of-pocket loss of 2 cents per thousand for purchased gas which it resold. This is an example of what might happen to any independent producer or gatherer.

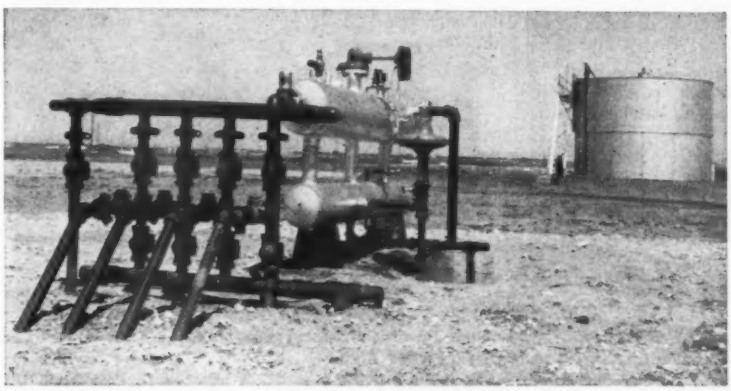
How the courts ruled.—Charging confiscation, Interstate appealed to the circuit court. On August 3, 1946, the court upheld the FPC, and on January 6, 1947, the Supreme Court of the United States refused to review the decision.

The unanswered question put to the FPC counsel during the trial was not answered by the circuit court's decision. But there was a strong implication that FPC could exert the same sort of regulation over any independent producer.

Two of the three circuit judges said that while FPC cannot regulate the actual processes of production and gathering it can regulate sales of gas into interstate commerce. The third judge, dissenting, said that since all activities and the passing of title took place within the state of Louisiana the sales were not made in interstate commerce and therefore were outside FPC jurisdiction.

On the matter of confiscation, the majority of the circuit court held that the total sum received by Interstate for the sale of its own gas and purchased gas together yielded a fair return on its capital investment in its producing and gathering properties, and therefore it made no difference that the purchased gas had to be resold at a loss.

Price-fixing theory.—It is this matter of fair return on investment which



ONE OF MANY.—This is a photograph of a typical Canyon reef producing lease in West Texas' Kelley-Snyder pool. The four-well centralized manifold, horizontal separator, and stock tanks are on the Pearl B. Lary lease, Lot 30, Section 16, Block 1, J. P. Smith Survey, of Lone Star Producing Co. Current allowable is 160 bbl. per day with 18 producing days a month. The huge productive area of the reef trend now stretches completely across Scurry County in a northeast-southwest direction.

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raises the fear on the part of independent producers. FPC regulates gas prices on the ancient formula developed to set railroad freight rates. It allows a maximum return of 6½ per cent on the actual cost of investment less depreciation. This might work out all right as applied to physical properties such as a pipe line itself, but is not practical when applied to producing gas properties.

As applied to gas production, the theory of limiting profit to a percentage of investment puts a premium on dry holes and a penalty on discovery. Examples of how this works out were given in two articles in the May 4 issue of The Oil and Gas Journal, pages 57 and 62.

This, then, is the basis of the fear that independent producers may be regulated. Since the fear was first raised in 1946 nothing tangible has occurred to make it a reality. But there have been hints of action.

Order 139. — Some months after the Supreme Court refused to review the Interstate decision the Federal Power Commission issued Order No. 139 in which it promised not to stretch the meaning of the Interstate case and not to attempt to regulate independent producers making arm's-length sales to nonaffiliated interstate pipe lines. But Commissioner Draper dissented, on the ground that if the law gives FPC authority to regulate such sales, FPC has no discretion to refrain from using its authority.

Order No. 139 is still on the books, but Draper is still on the commission. More recent appointees, with Draper, probably now constituting a majority, have indicated that they agree with Draper and that the order is meaningless and should be withdrawn.

New development.—Only one tangible thing has happened during the 4 years that Congress, the commission, and the industry have been wrangling over the subject. This was the case filed by FPC against Phillips Petroleum Co. *(The Oil and Gas Journal, April 20, page 133).*

In this case FPC has ordered Phillips to show cause why it should not be classed as a "natural gas company," which means subject to FPC control. No rates, prices, nor other matters are involved, though such can be expected later if the commission wins the case.

It is generally agreed that the Phillips case will be the first test of the commission's assumed powers as laid down by the circuit court in the Interstate case 4 years ago, even though Phillips is not a typical independent producer in all respects. Phillips is a very large producer, buyer, seller, and gatherer of natural gas, and while it has no interest in any interstate gas pipe line it is an important supplier of several and the sole supplier of one—Michigan-Wisconsin Pipe Line Co.

Of course the FPC has never disclosed its strategy, but if it follows the usual pattern for extending bureaucratic controls, the Phillips case could furnish it with a good entering wedge toward its suspected goal of regulating independent producers.

It might be relatively easy for FPC to convince the courts that Phillips' sales prices should be regulated because of their importance to one particular interstate line. With this established, the commission could move in on many other of Phillips' gas operations, perhaps one at a time as something occurred which appeared to have a bearing on interstate commerce and thus might stand up in court.

The next step would be to go after one of Phillips' competitors, or some company only slightly less intimately connected with interstate transmission. After two or three favorable decisions of this sort the commission would have legal precedent for fixing the prices of almost any natural gas which eventually reached an interstate line.

Then the jig would be up for all independent producers, and FPC could, if it desired, fix the well-head price of all pipe-line gas.

Legal deterrents.—There are two legal flaws in this pessimistic line of reasoning.

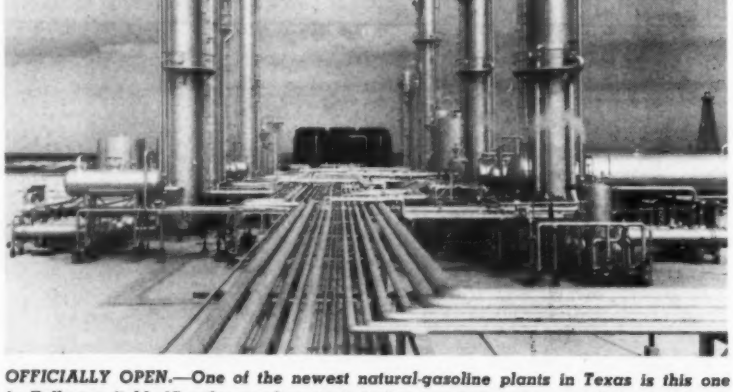
The first is state statutes fixing minimum field prices for natural gas, such as are on the books in Kansas and Oklahoma. The FPC has never intimated that it would attempt to upset such prices. Of course, it might change its mind, and it remains to be seen what the courts would say about this. Therefore, producers selling under a state minimum-price statute may be safe from FPC control.

The other is the position taken by Commissioner Draper. Most lawyers agree with him that FPC has no discretion; if Congress intended it to regulate one producer it is the commission's duty to regulate them all; instead of picking an isolated borderline case (Phillips, for example) for a test it should crack down on all one-well operators at once.

If FPC attempted any such sweeping regulation all at once it would, of course, stir up such a hornet's nest of opposition that the Kerr bill veto would be overridden and perhaps even more restrictive legislation enacted. FPC undoubtedly knows this, and so it may be expected to worm its way into the field gradually, one case at a time.

That's where the matter stands today, and to return to the original question which many independent gas producers are asking:

The only thing for a producer to do is to sit quietly until the axe falls —or make certain that none of his gas ever reaches an interstate pipe line.



***OFFICIALLY OPEN.**—One of the newest natural-gasoline plants in Texas is this one in Fullerton field, 17 miles northwest of Andrews, which was opened for public inspection May 21. The plant has 15 owners and is being operated by Stanolind Oil & Gas Co. It is designed to process 55,000,000 cu. ft. of gas daily and is now processing 38,000,000 cu. ft. Present recovery is about 80,000 gal. of propane, 50,000 gal. of butane, and 50,000 gal. of natural gasoline daily. Other owners include Mid-Continent Petroleum Corp., Texas Pacific Coal & Oil Co., Superior Oil Co., Gulf Oil Corp., The Texas Co., Anderson-Prichard Oil Corp., Elizabeth Frankel, British-American Oil Co., Bay Petroleum Corp., Pearl Frankel, Champlin Refining Co., Paul F. Barnhart, Donald Frankel, and Harding Frankel.*

Study of "Monopoly"

FTC volunteers to investigate industry from stem to stern; thinks integrated companies may be unfair to independents

Bertram F. Linz

WASHINGTON.—The Federal Trade Commission told the House Interstate Commerce oil subcommittee last week that there are a number of monopoly questions in the oil industry but refused to go on record about what should be done about them.

The commission's views were submitted at another of the hearings on the oil situation which the subcommittee has been holding at intervals. The spokesman was John Carson, former Washington representative of the Cooperative League of America, who was appointed to the commission last fall.

Carson said the FTC would be very glad to make the over-all investigation of the industry proposed by Rep. Clarence Cannon of Missouri last February 23. He disclosed that in addition to the investigation which it is making to determine whether there is an international cartel the commission is conducting two other probes of the oil industry. He declined to say what these inquiries covered, however.

Other studies proposed. — The commissioner suggested that two other investigations might be undertaken, if Congress provided funds. One would be a definite study of the nature and trend of concentrations in the industry and of the nature, extent, and economic consequences of the power of the large companies. The other would be an inquiry into the extent to which oil pipe lines are, in fact, operated as common carriers.

"The key characteristic of the petroleum industry is integration," Carson told the subcommittee.

"The integrated oil companies operations include oil production, refining, marketing, and transportation, including crude pipe lines, product pipe lines, and tankers. Fully integated operations afford obvious advantages in programming and planning. Fully integrated operations afford an assured supply of raw materials, a cheap means of transportation, and an assured marketing outlet.

"Such integrated operations are asserted to give enormous advantages to the integrated concern compared with the independent operator. We believe that the examination of the competitive advantages of integrated and nonintegrated concerns in the industry's various activities will afford an indication of the reasons why various independent segments of the industry have recently been under considerable pressure."

Good or bad? — Under questioning, however, Carson refused to express an opinion as to whether integration in industry is good. He also refused to commit the commission on the question of an international oil cartel, explaining that only recently has it received some, but not all, of the information it had asked the companies to furnish. However, he said, a "Swedish Oil Report," which has not been published in the United States, devotes an entire chapter to "Cartels and Other Competition - Limiting Measures" in which it is charged the oil companies in Sweden have cooperated under international agreements, including a so-called "Draft Memorandum of Principles."

Carson disclosed that only food has been subject to more study than oil during the life of the FTC, and that 13 reports have been published on oil questions in the past 35 years. During that period, he said, "many thousands" of letters of complaint against industry members have been received, on the basis of which 57 formal complaints charging restraint of trade have been issued.

The commission also summarized National City Bank tabulations of profits, showing that oil producers and refiners consistently make better returns than other industries, but under questioning admitted that the bank figures covered only 44 oil companies and 1,600 for all manufacturing and that these comprised the large and medium-sized companies only and therefore did not represent earnings in production or refining as a whole.

Complaints cited. — The complaints that come to the commission relative to competitive advantages of the major integrated companies over the independents, Carson said, most generally cite the majors' cheap means of transportation, by pipe line and tanker; ready access to supplies of crude, assured by ownership of crude and access through crude-oil trunk lines; assured marketing outlets resulting from a highly integrated marketing program, which involve exclusive-dealing contracts and the use of short-term cancellation clauses in leasing and subleasing arrangements; tire, battery, and accessory programs which provide a profitable source of income without requiring proportionate investment; and the opportunity to diversify risks, realize income from various branches of the industry's activities, including crude production, transportation, and marketing, and not to be handicapped by a condition in which one or more branches of the industry are temporarily unprofitable.

Other questions. — Questions which have been raised are whether processing agreements represent unfair trade practices, the alleged refusal of the majors to exchange crude and gasoline with independents, the advantages to the majors of the percentage depletion allowance, and operations under the Interstate Oil Compact.

"Although there is reason to believe that these advantages exist for the major integrated companies," Carson concluded, "investigation will be necessary before it is possible to say with confidence how important any one of them is; how effectively they reinforce each other; what, if any, off-setting advantages are enjoyed by small concerns; and whether or not the aggregate result is such a disparity of power and opportunity as to doom the independent concerns unless remedial measures are taken.

"There have been impressive complaints that independents are being driven to the wall and that the major companies are following monopolistic policies. Some facts which are matters of common knowledge appear to support these complaints. It is the proper function of the Government to reverse whatever monopolistic trend may exist in this industry, and the first step in that process is an investigation to make sure just what the facts are. Insofar as the complaints are not justified, the large petroleum companies have the right to public vindication; insofar as the complaints are justified, independent business and consumers of petroleum products have a right to better protection."

Advocates to be heard.—This week the subcommittee was scheduled to hear argument why the FTC should make the investigation proposed by Congressman Cannon. Cannon and others interested, including representatives of the independent producers and refiners, cooperatives, and marketers, are expected to plug for the industry, for which Congress would be asked to appropriate $250,000.

Cannon's resolution would call on the commission to "discover and determine" all the facts essential to the drafting by Congress of a "national policy for the conservation, production, transportation, refinement, and

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distribution of petroleum products of every kind and nature."

More specifically, Cannon would have the commission determine whether monopoly in the oil industry adversely affects the public welfare and whether integration has tended to destroy competition or eliminate small and independent refiners and markets. The FTC, however, also would be instructed to study the effects of the Interstate Oil Compact Commission and the states' conservation activities, the percentage depletion allowance, foreign operations of American oil companies, and the relations between oil operators and companies and financial or credit organizations.

Commenting on the numerous investigations of oil which have been made and the competition between congressional committees, Chairman Harris told Carson he was not in favor of investigations which go on and on and never get anywhere and indicated the House committee might not approve sending the resolution to the floor for adoption.

Tidelands Report

Judiciary committee asks adoption of Walter Bill

WASHINGTON.—The House judiciary committe sent a formal report to the House last week recommending adoption of the Walter bill confirming the title of the states to the tidelands lying within their claimed boundaries.

"All agree that only the Congress can resolve the long-standing controversy between the States of the Union and the departments of the federal Government over the ownership and control of submerged lands" which originated in 1938, the committee said.

"The longer it continues, the more vexatious and confused it becomes. Interminable litigation has arisen between the states and the federal Government, between applicants for leases under the Federal Mineral Leasing Act and the departments of Justice and Interior, and between the states and their lessees. Much-needed improvements on these lands and the development of strategic natural resources within them have been seriously retarded.

"The committee deems it imperative that Congress resolve this needless controvery at the earliest possible date and bring to an end, once and for all, the confusion, chaos, inequities, and injustices that have resulted from the inaction of Congress."

Enactment of the legislation is vitally needed, the committee said, in order that the Government may lease the Continental Shelf outside the state boundaries.

"The committee is also of the opin-

WATCHING WASHINGTON

Bertram F. Linz

Bill-in-Waiting

Supporters of tidelands legislation are waiting until the furor over veto of the natural-gas bill dies down before making an attempt to secure action in the House on the bill approved some time ago by the judiciary committee which would restore to the states their title to the offshore oil fields.

They are confident that if the bill is brought up at the proper time it will be passed by the House, although many concede there is little chance that the Senate will act upon it, particularly if House action is delayed much longer.

There is a good possibility that the Supreme Court will have acted on the Texas and Louisiana cases before the bill is brought up.

Members of Congress from the gas-producing states have not permitted the controversy over the Kerr bill to die down, particularly Senator Kerr, himself, who has put into the Congressional Record a large number of newspaper editorials and items commenting upon President Truman's veto of the measure, all of them uncomplimentary to the President.

Proponents of state ownership of the tidelands do not believe it advisable to bring their legislation up while the gas fight continues, since opponents of the Kerr bill would immediately train their guns on it as another effort to mulct the public.

Too Many Indictments

Department of Justice officials may be a little more careful in the handling of antitrust matters in the future as the result of a scathing rebuke administered recently in open court by Federal Judge Alexander Holtzoff in Washington.

The department, said Judge Holtzoff, is bringing too many indictments against corporations when the acts charged bear no "malevolence or immorality," with the result that businessmen no longer feel that any "stigma" attaches to a conviction for antitrust law violations.

The jurist let loose when a government attorney, attempting to placate defense lawyers who were defending the integrity of their clients, admitted the department was not contending the defendants were "vicious or predatory."

"Then why did you proceed by indictment?" the judge asked. "Irrespective of how the decision goes in this trial, the court has the feeling that this matter should have been brought here by civil suit. It is unfair to indict these men, where there is no malevolent or immoral act.

"When a person is indicted, in the eyes of the public he stands stigmatized and the stigma is not completely removed even if he is subsequently acquitted," he reminded the government.

A rebuke from the court is something for even a government lawyer to take heed of, but in this instance the lesson was more than usually pointed for Judge Holtzoff, before he went to the bench, was himself an offical of the Department of Justice for some years.

FTC Is Next

A number of companies in the oil and other industries think the Federal Trade Commission has been overactive in its drive against business, but a lot of people think it hasn't been active enough or able enough, with the result that the House small-business committee is preparing to launch an all-out investigation of the commission and its procedures.

It is true that the commission receives hundreds of complaints for every one it acts on, but officials explain that the great preponderance of letters and telephone calls deal with matters in which there is no substantial public interest and are thrown out. If the commission had more money, they intimate coyly, it might be able to do something about some of these now unconsidered complaints.

Just what charges against the FTC have influenced the House committee to dig into it has not been disclosed, but it is understood that some of the urge for the probe comes from cooperative associations. John Carson, one of the two members appointed to the commission last fall, happens to have been Washington representative of one of the major cooperatives for 9 years prior to his nomination.

When the small-business committee digs into the commission's activities, however, it is expected to devote considerable attention to oil, which is the subject of a large volume of the complaints filed with the FTC, and probably will want to know why so little has been done in this particular field.

ion that legislative action is necessary in order to confirm and give validity to Presidential Proclamation 2667 of September 8, 1945, wherein the President, by executive declaration, asserted, in behalf of the United States, jurisdiction, control, and power of disposition over the natural resources of the subsoil and seabed of the Continental Shelf," the report stated. "Many other nations have made assertions to a similar effect with respect to their continental shelves, and the committee believes it proper and necessary that the Congress make such an assertion in behalf of the United States."

The committee report was accompanied by minority views signed by eight members who stood firm in support of the Supreme Court decision in the California case.

"From Teapot Dome through Elk Hills, out into the Pacific Ocean, and now into the Gulf of Mexico, the fight for oil goes on with increasing fury," declared the minority, whose main argument was that nobody can own and only a sovereign nation can control the waters in the 3-mile zone.

The whole fight, the minority report admitted, centers around who is to get possession of the oil which lies under the coastal waters, regarding which it was both historical and lyrical.

Oil Committee Elevated

WASHINGTON. — The Munitions Board announced another reorganization last week which will elevate the petroleum committee under Rear Adm. B. B. Biggs to the status of a division in a newly created office of production management.

Purpose of the reorganization is to provide the board a more effective working line-up, it was explained by Chairman Hubert E. Howard.

The petroleum committee was formerly the Armed Services Petroleum Board, enjoying independent status until May 1949, when it was transferred to the Munitions Board and given broad responsibilities for the preparation of plans for mobilization and supply involving oil. The latest shift, it was said, is not expected to change the scope or duties of Biggs' office.

Depletion Victory

WASHINGTON.—The Treasury Department lost another of its numerous fights with Congress last week when the House ways and means committee rejected its proposals for a cut in the percentage depletion allowance.

The committee not only decided to make no change in existing percentages for oil, gas, sulfur, and nonmetallic metals, but added more commodities to the list on which depletion would be allowed.

The oil-depletion allowance was a major target of the Treasury in its drive for the closing of tax loopholes, and also was specifically singled out for attack by President Truman in his tax message to Congress when he cited a mythical "Mr. X" whose avoidance of taxes on millions of dollars by reason of his ownership of oil interests was put forward as a major reason why the allowance should be cut or restricted.

Regardless of the committee's action on the allowance, however, there now appears little likelihood that the cuts in excise taxes planned in Congress will get presidential approval. The ways and means committee has far exceeded the amount of revenue which the President was willing to forego to cut the excise levies and is not expected to develop the offsetting revenue which he demanded as the price of those cuts.

RFC Spanked

Critical report submitted, but Texmass draws on loan

WASHINGTON.—The Senate committee on banking and currency last week issued a report highly critical of the Reconstruction Finance Corp. for making a loan of $10,100,000 to Texmass Petroleum Co.

In submitting the report, however, Sen. J. W. Fulbright of Arkansas, chairman of a subcommittee which has been investigating the RFC, disclosed that Texmass began drawing down the loan May 17 so apparently there was nothing more the committee could do in this matter.

The report repeated charges made at the committee hearings that approval of a loan of this type is beyond the authority granted RFC by Congress.

From its study of the facts and circumstances surrounding the loan, the subcommittee said it was evident that the RFC board of directors gave "only casual and superficial consideration and study" to the application and "those directors who approved this loan, and extensions thereof, disclosed inadequate knowledge of the significant facts and features" and overruled the findings and recommendations of their own review committee without persuasive evidence justifying such action.

"The subcommittee believes that the lending of public funds is a function requiring at least an equal degree of care with that desirable for the protection of the investing public," the report commented in discussing the intensive review given by the SEC to the company's registration statement.

The subcommittee reiterated its allegations that the primary consideration of the loan is a bail-out of existing creditors of the borrower, to whom, it said, 81 per cent of the loan will go, thus "minimizing their risk of loss in a highly speculative venture."

A third point raised by the committee was the failure of the RFC to convince it that the loan is of the character intended by Congress and the alleged failure of the RFC to show, as required by its enabling act, that the loan will "encourage small business," "help in maintaining economic stability of the country," and "assist in promoting maximum employment and production" to the extent necessary to justify disbursement of public funds "to aid in financing agriculture, commerce, and industry."

It also charged that the RFC failed to establish that financial assistance to Texmass was not otherwise available on reasonable terms.

Finally, said the subcommittee, the the RFC has not shown that the loan is of such sound value or so secured as reasonably to assure retirement or repayment as required by the act. On the contrary, it said, on the estimates of reserves and earnings most favorable to the borrower, relied upon by the RFC, the loan cannot be repaid within the 10 years to which RFC advances are limited.

Unemployment Study

WASHINGTON. — A fast-moving investigation into the causes of unemployment in the oil and five other industries got under way this week before a Senate labor subcommittee composed of Sens. Matthew M. Neely, West Virginia, chairman; Elbert D. Thomas, Utah; and Robert A. Taft, Ohio, just 10 days after it was first proposed.

Aimed primarily at developing the effect of oil imports upon the oil, coal, and railroad industries in West Virginia, the inquiry also will go into the causes of increasing unemployment in the silver, zinc, and lead industries, covering a mere half-dozen out of more than a score of industries which are complaining bitterly of the effect of a flood of foreign goods which they charge is being dumped on the American market.

The Senate investigation, proposed by Neely in a resolution introduced May 12, approved by the labor committee and passed by the Senate May 15, is only one of several now going on. A House labor subcommittee is investigating the effects of imports on employment, the Treasury is making a probe of alleged dumping, and the Tariff Commission is considering at least one application for an inquiry under the reciprocal-trade procedure.

Neely's investigation which will be handled expeditiously but, he promised, will be thorough, must be completed within a period of 5 weeks in order that a report may be made to the Senate by June 25, the deadline set in the resolution.

XUM

Unparalleled System

Present program to double capacity of Great Lakes pipe lines, which deliver products for 18 firms to 14 terminals

C. O. Willson

GREAT LAKES PIPE LINE CO., largest and oldest of the product pipe-line operators, is rapidly completing an enlargement program which in 1951 will enable it to deliver 65 million barrels of refinery products annually (177,000 bbl. daily) over a large area of the Middle West.

The present enlargement program, which will approximately double the permanent pipe-line capacity of the system, is expected to be completed this year. Shipments over the system originate principally from Oklahoma and Kansas refineries.

The Great Lakes system, as shown on the accompanying map, has no parallel in product pipe-line operations. It is a common-carrier operation and is currently owned by eight companies, all of which use its facilities. These owner companies are Continental Oil Co., Mid-Continent Petroleum Corp., Skelly Oil Co., The Texas Co., Pure Oil Co., Sinclair Refining Co., Cities Service Oil Co., and Phillips Petroleum Co.

In addition to the eight owners, 10 nonowner companies originate shipments over the Great Lakes system: Wilcox Oil Co., Sunray Oil Corp., Midland Cooperative Wholesale, Tide Water Associated Oil Co., Kanotex Refining Co., Farmers Union Central Exchange, Inc., National Cooperative Refinery Association, Johnson Oil Refining Co., Deep Rock Oil Corp., and El Dorado Refining Co.

The locations of the connected refineries are shown in an accompanying table.

The refinery organizations which connect directly with the Great Lakes system have a crude-oil capacity of 307,000 bbl. a day and a cracking capacity of 200,000 bbl. daily. These figures are exclusive of the capacity represented by refineries which connect through their own or other products lines to the Great Lakes system.

Shipments can be consigned over Great Lakes lines to 14 existing terminals owned by the company and located in important consuming centers in seven central and north-central states. In a recent study made by Great Lakes it was shown that shippers were delivering products to approximately 2,400 destinations from these 14 terminals.

In addition, consignments to St. Louis can be made from southern originating points on the Great Lakes system for transmission through Great Lakes lines to Paola, Kans., where they are transferred to Phillips Pipe Line Co. lines for movement to St. Louis.

History.—Great Lakes Pipe Line Co. will be 20 years old in July. It was conceived by its original owners as the feasible answer to a situation in which it was becoming more and more uneconomic to operate refineries in Oklahoma and Kansas and dispose of their products by tank-car transportation to points in the Middle West.

Operators in the two states, whose plants at one time accounted for 15 per cent of the total refinery capacity in the United States, were at a disadvantage in competing with companies that transported crude oil to consuming centers in the Middle West and operated refineries in that area.

The original proponents of the product pipe line had to overcome the fears of skeptics who doubted that a large product line was practical from an operating standpoint and who also did not believe that a common-carrier system serving several refineries would prove practical. The original owners were: Continental Oil Co., Mid-Continent Petroleum Corp., Pure Oil Co., Barnsdall Oil Corp., Phillips Petroleum Co., and Skelly Oil Co., all of which operated at least one refinery in the two states at that time.

The Texas Co., with a refinery at West Tulsa, and Sinclair Refining Co., with refineries in both Oklahoma and Kansas, became stockholders in 1933 and started deliveries from their plants. Cities Service Oil Co., with a refinery at Ponca City, Okla., joined the system as an owner-shipper in 1938. Barnsdall sold its interest in Great Lakes in 1938, the same year that it disposed of its refineries.

Construction of the new project started in mid-1930 and the first shipment of products reached Kansas City the latter part of that year. Initial originating points were Okmulgee, Muskogee, Tulsa, Barnsdall, Ponca City, and El Dorado. Terminals were located at Kansas City, Omaha, Des Moines, Iowa City, Chicago, and Minneapolis. The system consisted of 6 and 8-in. lines connecting the refineries and terminals and the initial capacity of 24,000 bbl. was devoted entirely to transportation of gasoline.

Quick success.—Although unforeseen problems in operation arose, the practicability of such a system was soon evident. It proved that gasoline could be pumped under high pressure and delivered on specification to the shipper several hundred miles from the point of origin.

Through the 20 years of its existence there has been a steady growth in capacity of the Great Lakes system. Consignments increased steadily in the early years, helped by the addition of Texas and Sinclair to the list of owner-shippers. The first capacity increase of the system was achieved by addition of pumping stations, followed by building of parallel lines. In 1935 capacity between Kansas City was doubled with construction of a second 12-in. line. Other

REFINERIES CONNECTED WITH GREAT LAKES PIPE LINE*
(Capacity figures are based on the 1950 survey of The Oil and Gas Journal)

Company and refinery location—	Crude-oil capacity	Cracking capacity
KANSAS		
Cooperative Refinery Association, Coffeyville	19,000	11,200
El Dorado Refining Co., El Dorado	8,500	8,000
Kanotex Refining Co., Arkansas City	8,500	†9,500
Phillips Petroleum Co., Kansas City	50,000	14,000
Skelly Oil Co., El Dorado	35,000	31,500
Total Kansas	121,000	74,200
OKLAHOMA		
Cities Service Oil Co., Ponca City	13,000	4,500
Continental Oil Co., Ponca City	52,500	29,250
Deep Rock Oil Corp., Cushing	16,000	15,000
Johnson Oil Refining Co., Cleveland	6,000	2,750
Mid-Continent Petroleum Corp., Tulsa	45,000	32,000
Midland Cooperative Wholesale, Cushing	6,500	2,300
The Texas Co., Tulsa	30,000	29,000
Tide Water Associated Oil Co., Drumright	12,000	9,500
Wilcox Oil Co., Bristow	5,000	2,200
Total Oklahoma	186,000	126,000
Total Oklahoma and Kansas	307,000	200,000

*In addition shipments are received at other locations from shipper companies which use manufacturing facilities other than the refineries listed. The originating points and the shippers are: Drumright, Okla., Sunray Oil Corp. and Wilcox Oil Co.; Kansas City, Kans., Phillips Petroleum Co. and Sinclair Refining Co.; Irvington, Neb., Midland Cooperative Wholesale and Farmers Union Central Exchange, Inc. †Includes 5,000 bbl. per day catalytic reforming capacity.

new lines followed at various periods.

Additional refineries built lines to the system and as sales distribution of shippers grew in the area served by Great Lakes, the volume of their pipe-line shipments increased. In two instances lines built to the Great Lakes system by refineries were purchased by the carrier.

Originally, and until June 1941, proportional tariff rates were used by Great Lakes. These caused shippers to pay a rate to the final destination that was equivalent to the cost they would have had to pay had the shipment been made the entire distance by rail. In 1941 Great Lakes rates were reviewed by the Interstate Commerce Commission and it established local rates from points of origin to terminals on a basis lower than those existing.

Postwar expansion.—As soon as equipment and materials became available after close of the war, Great Lakes Pipe Line Co. spent approximately $30,000,000 in expanding and modernizing its facilities. Approximately 1,200 miles of line were added to take care of increased traffic demand. An 8-in. replaced a 6-in. line from Tulsa to Barnsdall, an 8-in. was built from El Dorado to Humboldt, and a third 8-in. added from Barnsdall to Kansas City. The largest mileage increase came through extension of the system into new territory with an 8-in. line from Kansas City to Alexandria, Minn., serving terminals at Omaha, Sioux City, Sioux Falls, Watertown, and Alexandria. From Alexandria a 6-in. line was built to Grand Forks, supplying a terminal there and at Fargo.

At the start of this expansion and modernization program, economists were predicting that high consumption of gasoline and other refined products was strictly a wartime condition, that it would be at least 5 years before peacetime demand would reach this level. A survey was made by Great Lakes of its shippers, asking them to estimate the volume of their future traffic requirements. Based on this survey the system was expanded to a capacity which it was estimated would not be reached for 10 years.

Before these additions were completed, it was apparent that the petroleum consumption curve, instead of descending as predicted, was continuing to climb. Offerings of shipments soon were exceeding the pipeline capacity which it was believed would be adequate for years to come.

Further lines could not be laid as manufacturers would not promise deliveries of pipe in less than 2 to 3 years. Also, several connected refiner-shippers began to add capacity and modernize their refineries, and others announced plans for similar construction. Until these plans were definite, the carrier, in addition to being unable to obtain pipe and other equipment items, had no basis for calculating capacity that would be required to accommodate the output of enlarged refineries.

By the spring of 1949 refinery-expansion plans were completed or intended capacities were made known and pipe had again become available on relatively short-term delivery. As a result, Great Lakes decided to spend an additional $55,000,000 in further expansion of practically all phases of the system to meet the pent-up traffic demand. A bond issue for that amount was quickly placed to finance new construction.

When the present program is completed the following lines will be in operation: Tulsa to Barnsdall, 8 and 12-in. lines; Ponca City to Barnsdall, 8 and 12-in. lines; Barnsdall to Kansas City, three 8-in. and two 12-in. lines; Kansas City to Des Moines, two 8-in. and one 12-in. lines; Des Moines to Minneapolis, two 6-in. and one 12-in. lines; Kansas City to Sioux Falls, 8 and 12-in. lines; Sioux Falls to Alexandria, Minn., 8-in. line; Alexandria to Grand Forks, 6-in. line. In addition there are lines of various sizes as shown on the accompanying map.

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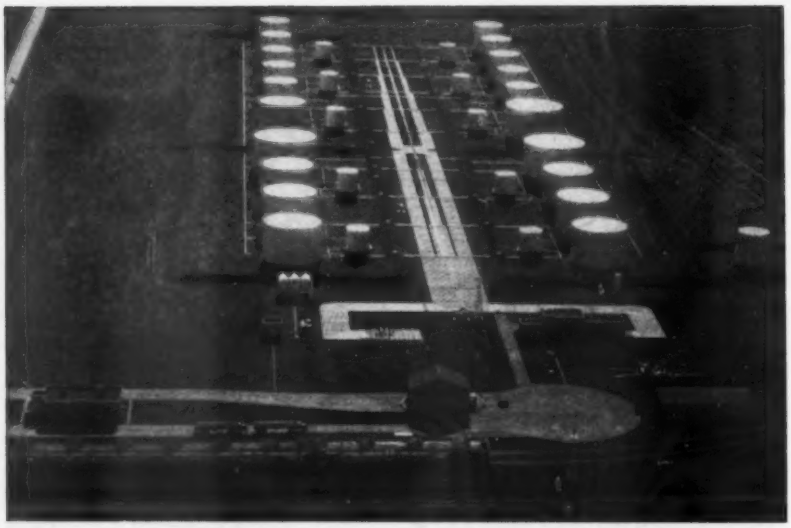


Great Lakes terminal facilities and station at Sioux Falls, S. D.

The new 12-in. lines have pumping stations at 100-mile intervals. Primary stations are located at 50-mile intervals on the 6 and 8-in. lines.

The stations are primarily diesel-powered units except at Des Moines and Kansas City where electric power is purchased.

Designs of terminal facilities provide for simultaneous handling of nine products.

Minimum volume.—Companies using the Great Lakes system are required to provide a minimum shipment of 25,000 bbl. and the shipper is entitled to delivery from terminals of the same volume of products that was accepted from it at the refinery. Gasoline not withdrawn from the terminal within 90 days after its arrival is subject to a demurrage charge.

Because the refineries operate with varying type crude oils and because their processing facilities and marketing requirements are not uniform, there has to be considerable flexibility in the Great Lakes system.

Specifications for products it will accept for shipment are established by the carrier, taking into consideration requirements of shippers. In setting specifications an attempt is made to establish those that will afford a balance between maximum service to shippers and maximum volume to the carrier. In case of gasoline, terminals have facilities to add tetraethyl lead.

As would be expected, there have been changes from time to time in the operation of the system involving both refineries and distributing facilities. Several of the original refineries connected to the system have been discontinued by their owners while, as mentioned, additional refineries have built lines to the system. In no instance has a company which continued in the refining business ever withdrawn as a shipper over the Great Lakes system.

When the present expansion program is completed, the working tankage—an integral part of the pipe-line operation—will total approximately 10 million barrels. This does not include tankage at refineries which belongs to the refinery organizations. In addition to working tankage, the system, as designed, will have approximately 1,882,000 bbl. of products in transit through the lines at all times.

Increased tankage will permit the carrier to have at terminals a larger volume of products in advance of peak periods of demand. For example: Furnace oils can be transmitted during the summer and put in tankage before the heating season arrives in north central states. Larger line capacity will allow a greater volume to be transported more rapidly underground during periods of heavy demand regardless of weather conditions. The additional capacity also will be of great value when the farm use of products increases rapidly with arrival of spring and later in the harvest season.

Great Lakes did not provide for motor-truck loading at terminals until 1942, previously depending entirely on tank-car deliveries from terminals. Now users of the system, either directly or through motor transports operated by other concerns, have deliveries by trucks through the year.

In northern states truck deliveries are affected during cold weather by heavy snows and during the spring thaws by restrictions imposed by state highway commissions on weight of loads that vehicles are allowed to transport over highways in certain localities. During these periods tank-car deliveries from terminals increase.

Complete chemical tests of shipments are made at the refineries and also at the terminals before products are delivered. A laboratory for control purposes is operated at Kansas City by the Great Lakes company.

Techniques.—As Great Lakes was one of the pioneers of pipe-line transportation of refined products, designs for the original system were based largely on experience of crude-oil pipe-line operations. Since that time there have been many developments in operating techniques that have added to the efficiency and economy of product transmission. There were several problems peculiar to product transmission which had to be solved.

Six-stage centrifugal pumps, powered usually by diesel engines, give a steady pressure in the line movement and reduce the area of mixture between shipments. With steady pressure, lighter-weight lines, not possible with the original reciprocal pumps, are now used.

In the last half of 1947, when demand on the Great Lakes system began to exceed its increased capacity, 12 secondary pumping stations were installed on three sections of the system. These units, housed in temporary structures, were powered with 12-cylinder V-type Allison aircraft engines, the first time such an engine had been used as a prime mover on a pipe line.

When present lines are completed and permanent pumping units are installed, these and other temporary pumping units will be abandoned.

Many of the technical developments of product pipe-line transportation have been described from time to time in The Oil and Gas Journal.

The operation of a common-carrier products system which transports products from refineries located adjacent to fields in the oil country to distant consuming centers long ago proved its worth. In the case of Great Lakes, transportation facilities of the carrier give refiner-shippers the advantage of climate, labor conditions, and other favorable situations found in southwestern states, without sacrifice of transportation costs in delivering products to buyers over a large consuming center.

The operation of Great Lakes Pipe Line Co. centers in the Kansas City general office located in the Bryant Building, and in area offices at Tulsa, Des Moines, and Sioux Falls. The company now has more than 1,200 regular employes.

Harry Moreland, who is widely known in transportation circles, has been an executive officer and member of the board of directors since organization of the company. He served as vice president and general manager from 1930 to 1942 and since 1942 has been president. Vice presidents are John L. Auch, J. B. Lawson, R. L. Wagner, and C. A. L. Walker. R. A. Kroenert is secretary-treasurer. Each owner is represented on the board of directors by a company official.

Reserves Aplenty

Westcoast Transmission cites figures showing sufficient gas for export plus 50-year supply for use within Alberta

Charles J. Deegan

CALGARY.—Gas reserves of Alberta are sufficient to support a trunk line to the West Coast, including service to the United States, and a line eastward into Saskatchewan and Manitoba, and still leave ample supplies to care for the local needs of Alberta for 50 years.

This is the conclusion of Westcoast Transmission Co., Ltd., which is seeking authority to build a gas line to the Puget Sound region. It is based on estimates of reserves which the company has submitted to the Alberta government in support of its application to export natural gas from the province. *(See The Oil and Gas Journal, February 2, page 28, and May 18, page 99.)*

Decision as to what line, if any, will be built hinges primarily on the volume of reserves in Alberta. Provincial interests insist that no export permit be granted until there is assurance that sufficient gas will be retained for all local needs.

The next consideration is preference to Canadian areas over United States consumers. This could mean that a proposed line eastward through Regina to Winnipeg might have the inside track. But its gas requirements would not be large, and the chief fight appears to be over a line to the west.

Two estimates.—The estimates of Alberta reserves submitted by Westcoast were prepared by the engineering firm of Ford, Bacon & Davis as of December 1949. In general they are more conservative than the estimates of a special commission of the Alberta government, headed by R. J. Dinning, as of February 1949, though the Westcoast report includes more fields and reaches a higher total.

A comparison of the two reserves estimates is shown in Table 1, and the fields named are shown on the accompanying map.

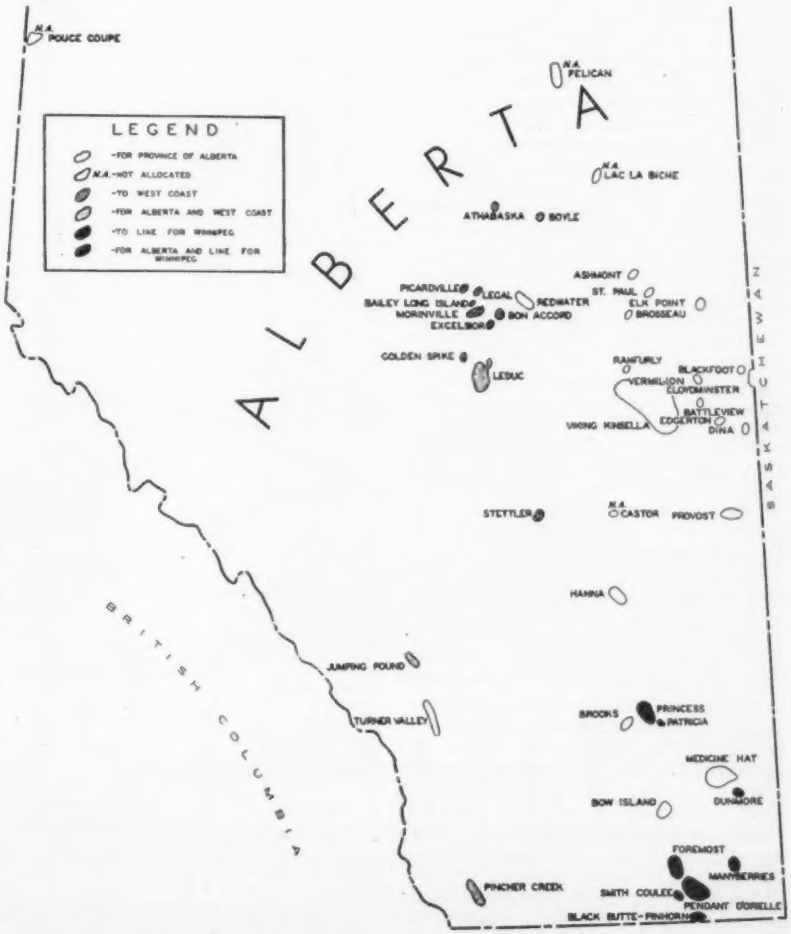
The principal differences between the Westcoast estimate and that of the Dinning commission lie in the subsequent developments at Pincher Creek and new discoveries since the Dinning report, some oil and some gas. The Dinning report took cognizance of the fact that the second well at Pincher Creek, then drilling, might prove up a very substantial reserve in this field. Hence, on the whole, there is far less difference between the two reports than might appear at first glance.

Political angles.—The question of how

TABLE 1—PROVEN GAS RESERVES—DINNING REPORT VS. WESTCOAST REPORT

(All data calculated to 100 psia. Abandonment pressure, 60° F. All figures in billions of cubic feet)

Area and field—	Westcoast	Dinning
Southeastern Alberta:		
Medicine Hat-Redcliff	233	250
Bow Island	17	25.3
Foremost (total)	38	43
Pendant d'Oreille	227	260
Manyberries	26	31
Black Butte-Pinhorn	34	39.5
Smith Coulee	2	2
Dunmore	18	24
Eastern Alberta:		
Brooks	9	11.3
Princess	252	362
Patricia	104	43.1
Hanna	33	24
Northeastern Alberta:		
Viking-Kinsella-Fabyan	842	994
Vermilion	3	7
Provost	100	52
Battleview	16	18.4
Lloydminster	12	14.8
Elk Point	7	7.8
North Central Alberta:		
Leduc-Woodbend	576	697.1
Redwater	144	129
Athabaska	14	16.4
Foothills—Alberta:		
Turner Valley	272	290
Jumping Pound	671	920
Total fields in Dinning report	3,650	4,261.7
Other fields listed by Westcoast:		
Pincher Creek	1,252	....
Morinville	667	....
Pouce Coupee	121	....
Stettler	36	....
Excelsior	36	....
Bon Accord	26	....
Golden Spike	25	....
Castor	25	....
Lac La Biche	25	....
Picardville	22	....
Misc. other fields	62	....
Total fields in Westcoast report	5,947	....



Map of Alberta Province showing location of producing gas fields. Legend at top left shows allocation of gas production as suggested by Westcoast Transmission Co. Estimates of reserves, by fields, may be found in the table above the map.

XUM

TABLE 2—ALLOCATION OF ALBERTA GAS RESERVES SUGGESTED BY WESTCOAST TRANSMISSION GROUP
(Billions of cubic feet)

Service to which allocated—	Allocation of proven reserves	Estimated requirements	Surplus margin
Alberta Gas Companies	3,111	*2,784	327
Saskatchewan-Manitoba line	680	†650	30
Westcoast Transmission System	1,979	‡1,869	110
Unallocated fields§	177	....	177
Total	5,947	5,303	644

*For 50 years' requirements. †For 26 years' requirements. ‡For 30 years' requirements. §Isolated fields, not economically available at present.

these reserves might be utilized to the best advantage of Canada has been a hot political question for many months.

The principal battle has been over the route of the gas pipe line to the West Coast. One group argued, on the basis of economics, that the cheapest and most feasible line should travel from Southwest Alberta into Southeast British Columbia, then drop quickly into the United States, serving the city of Spokane, Wash., and head west inside the United States to the West Coast, with a branch line north into Vancouver, B. C.

The other group argued that an all-Canadian route, from northern Alberta across British Columbia to Vancouver, with a branch line south into the United States, was economically feasible and would serve Canada's interest best. On this line, most of the construction expenditures and future taxes would be in Canada. Potential value in helping open a substantial area of British Columbia by making power available is also considered. All these factors weigh heavily in favor of Canadians by comparison with the southern route.

On these grounds the political representatives of British Columbia fought hard for the all-Canadian route and bitterly against the southern route. One important argument was effective. Once the gas passed into the United States the amount that could be sent northward into the Vancouver area, or other parts of British Columbia, would be subject to the decisions of the U. S. Federal Power Commission.

British Columbia anticipated that the availability of gas would gradually build up a larger and larger market in Canada. If, however, in the meantime, customers in the United States increased their requirements, the transportation facilities might be taxed beyond capacity to serve both groups with their increased demands. Under such circumstances, it was anticipated the natural inclination of the U. S. Federal Power Commission would be to favor the United States customers. Hence British Columbians foresaw a condition in which their own desires for increased gas supplies would be thwarted, simply because the United States market grew faster than the Canadian, even though the source of the gas was Canadian.

Other demands.—There is also in the proposal stage a gas pipe line east from Alberta through Saskatchewan to the Winnipeg area in Manitoba. Thus far no proposals have been made to extend any eastward line, south of the border into the United States. As a project solely to make a Canadian natural resource available to other Canadians beyond the Alberta border, such a line has a top political priority over any line which proposes to dispose of the bulk of its gas in the United States.

Reserves requirements of this line, as presented to Alberta Provincial government, are rather modest. Nevertheless, so long as anyone proposes to build such a line, to serve Canadians exclusively, the chances are that its claims on the gas reserves will be recognized as having priority over any export gas line.

The biggest and most important claim on the gas reserves is that of the people of the Province of Alberta. It is conceded that no permits for the export of gas from the province will be granted to anyone, even for export to another province, until Alberta's potential requirements for the next 50 years, as now foreseen, are provided for. In addition, Alberta's conservation authorities take the position that any gas-gathering system shall take residue gas from producing oil fields, insofar as practical, in such manner as to avoid flaring or other economic waste of gas produced with the oil.

The existence of these political and

TABLE 3—SUGGESTED ALLOCATION OF ALBERTA GAS RESERVES
(Billions of cubic feet)

Field—	Est. total recoverable reserves	To Alberta gas companies	To Manitoba-Saskatchewan line	To Westcoast line
Legal	16	....	....	16
Athabaska	14	....	....	14
Boyle	5	....	....	5
Picardville	22	....	....	22
Bailey-Long Island	14	....	....	14
Morinville	667	....	....	667
Bon Accord	26	....	....	26
Golden Spike	25	....	....	25
Leduc-Woodbend	576	350	....	226
Excelsior	36	....	....	36
Stettler	36	....	....	36
Jumping Pound	671	371	....	300
Pincher Creek	1,252	660	....	592
Subtotal	3,360	1,381	....	1,979
Dunmore	18	....	18	....
Princess	252	....	252	....
Patricia	104	....	104	....
Foremost-California	17	....	17	....
Pendant d'Oreille	227	....	227	....
Manyberries	26	....	26	....
Smith-Coulee	2	....	2	....
Black Butte-Pinhorn	34	....	34	....
Subtotal	680	....	680	....
Redwater	144	144	....	....
Ashmont	10	10	....	....
St. Paul	2	2	....	....
Elk Point	7	7	....	....
Brosseau	1	1	....	....
Vermilion	3	3	....	....
Lloydminster-Blackfoot	12	12	....	....
Viking-Kinsella	842	842	....	....
Battleview	16	16	....	....
Dina	2	2	....	....
Provost	100	100	....	....
Hanna	33	33	....	....
Turner Valley	272	272	....	....
Brooks	9	9	....	....
Foremost	21	21	....	....
Medicine Hat	233	233	....	....
Bow Island	17	17	....	....
Edgerton	6	6	....	....
Subtotal	1,730	1,730	....	....
Total all allocated fields	5,770	3,111	680	1,979
Fields not allocated:				
Pouce Coupe	121			
Pelican	9			
Lac La Biche	22			
Castor	25			
Subtotal	177			
Grand total	5,947			

Rewards of Wildcatting
WHEN the wildcatter strikes it rich, he's glad he used Youngstown. Tried and trusted, this top quality pipe is a true friend--dependable no matter what. Youngstown Oil Country Tubular Goods--drill pipe, casing, tubing,--will help realize the rewards of wildcatting.
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XUM

economic factors is back of what might otherwise seem an unusual presentation by a gas pipe-line company seeking a permit to export gas. Westcoast interests not only present their own estimate of gas reserves, as shown in Table 1, but go further. They present a tentative allocation of these reserves to various services, which on the face shows sufficient reserves for all purposes, with a margin for safety. This is summarized in Table 2.

The detailed allocation, field by field, is shown in Table 3.

Prospects.—While the obvious facts suggest that Westcoast is certain to get a permit to build its proposed line, Canadian observers say this is not necessarily so.

Competitors, they point out, might also submit proposals for lines along all-Canadian routes, perhaps differing from the Westcoast route.

Quite a few influential Canadians still are not convinced that the Westcoast route over the Rockies is physically or economically feasible. And, the recent statements of Prime Minister St. Laurent, while virtually setting national policy as favoring the all-Canadian route, still leave it to the Board of Transport Commissioners' discretion.

Many Canadians think that if Westcoast can show it can secure the financial support necessary to build the line, the burden of proving it not feasible will be almost impossible for its opponents.

EASTERN

Proposed Line

New company considering 400-mile products line

George Weber

NEW YORK.—A proposed common-carrier products pipe line serving upstate New York from tidewater refining centers near New York City and Philadelphia, is now in the planning stage.

An independent company, Penn-York Pipe Line Corp., has been formed to construct and operate the planned system. According to the company president, William P. Hayes, construction may begin late this year or in early 1951.

The line will be 400 miles long, have a capacity of 85,000 bbl. daily, and will cost an estimated $18,000,000.

The project is now in development and negotiation stages, and little information has been revealed regarding design details, tariff rates, refinery tieins, prospective shippers, or financing arrangements.

As shown on the proposed right-of-way, the line will branch in the vicinity of Allentown into two feeder legs originating near Linden, N. J., and Marcus Hook, Pa. It will serve northeastern Pennsylvania and Central New York with five terminal points: Rochester, Syracuse, and Binghamton, N. Y., and the Wilkes-Barre-Scranton and Allentown-Bethlehem regions of Pennsylvania.

Of the proposed flow of 85,000 bbl. daily of distillate products through the main trunk line, approximately 25,000 bbl. will feed through the Marcus Hook leg, and the remaining 60,000 will originate at Linden. The main line will probably range in diameter from 10 to 14 in.

Negotiations with prospective shippers, and tariff studies are now under way, company officials said.

Map showing the route of the proposed Penn-York products line.

While some aerial surveys of the planned right-of-way have been made, actual procurement of right-of-way has scarcely begun. Details concerning size and location of pump stations have not yet been fixed.

The new line would serve a region now traversed by three other product pipe-line systems, all operated by major oil companies. These are Buffalo Pipe Line Co. and Keystone Pipe Line Co. (Atlantic), Susquehanna Pipe Line Co. (Sun), and Socony-Vacuum Oil Co., Inc.

The New York-Philadelphia area includes the greatest concentration of refining capacity on the East Coast. Fourteen refineries, operated by 10 major oil companies total roughly 900,000 bbl. per day in crude capacity. In addition to serving some of these plants, the new pipe-line company may handle tanker shipments arriving at the two deep-water ports it touches.

While the company feels that it has sufficient material lined up to permit start of construction by year's end, no contracts have yet been let. Following current negotiations with prospective shippers, company officials expect to announce some weeks hence more concrete details on the proposed line.

It is understood that financing arrangements have been made. The engineering firm of Parsons, Brinkerhoff, Hall and MacDonald of New York City conducted original engineering estimates for the new company.

TECHNOLOGY

Balls of Fuel

Promising process offers gasoline in pellet form

George Weber

SAN ANTONIO.—Chemists at Southwest Research Institute are shoveling piles of gasoline and kerosine about like pea coal—and studying possible new uses for a novel process for pelletizing water-insoluble liquids.

The new discovery, known as the Carburolith process, was developed in France after the war. Owners of the process have designated Southwest Research to conduct pilot-plant study and development and to act as a headquarters for technical information on the subject.

Carburolith pellets are not capsules. They comprise small, highly porous spheres of algin, which hold the hydrocarbons in liquid form but resist leakage and prevent vaporization loss. They constitute about 98 per cent liquid by volume. The remaining 2 per cent of algin is a cellulose-like material which forms a homogeneous body of microscopic cells containing the liquid.

The pellets are not brittle but are nearly as pliable as grapes. They have sufficient strength to withstand piling in beds of 30-ft. thickness without rupturing. They may be produced in almost any size, but investigators at the laboratories favor sizes between ⅛ and ½ in. in diameter. Liquid content may be recovered by pressing between rolls, or by other similar mechanical means.

The pelletizing process is inexpensive and simple, say Southwest chemists. The oil product is first emulsified with a water solution of algin, a low-cost derivative of brown seaweed. The emulsion is then contacted with calcium chloride to form the hardened, impervious pellets.

Commercial possibilities of this new technique are only beginning to be investigated. It enables the handling and storage of liquids in solid form, greatly reducing the fire hazard of inflammable liquids. For example, a burning pile of gasoline pellets may be extinguished with a water hose.

Military engineers are showing interest in its adaptation to storage of fuels in small quantities.

This line of 10 GMV's in Royalite Oil Company's station No. 1, Turner Valley, Alberta, includes first 3 GMV's ever built and now totals 6,060 GMV horsepower.

GMV's in service at Royalite are used for gas transmission, underground storage, and in the manufacture of natural gasoline.

Royalite Oil Company's three 11-year-old GMV's, the first ever built, are still in continuous service; have held up so well that visitors can't tell them from the seven since added to this company's No. 1 station. Royalite's other two stations are likewise equipped with Cooper-Bessemer V-angles, Type GMV and the smaller GMX.

The most recent addition to station No. 1* is a GMV Turboflow, installed this past summer. It gives Royalite unprecedented advantages — a full 10% increase in power output compared with other units of equal displacement, plus at least a 15% reduction in fuel consumption.

If your plans call for compressor horsepower, bear in mind that Cooper-Bessemer Turboflow V-angles, GMX, GMV and GMW, are now available in sizes from 200 to 2500 hp. Check on the savings you can show!

*Station No. 1 is now owned by Madison Natural Gas Company, Ltd., a totally owned Royalite subsidiary.

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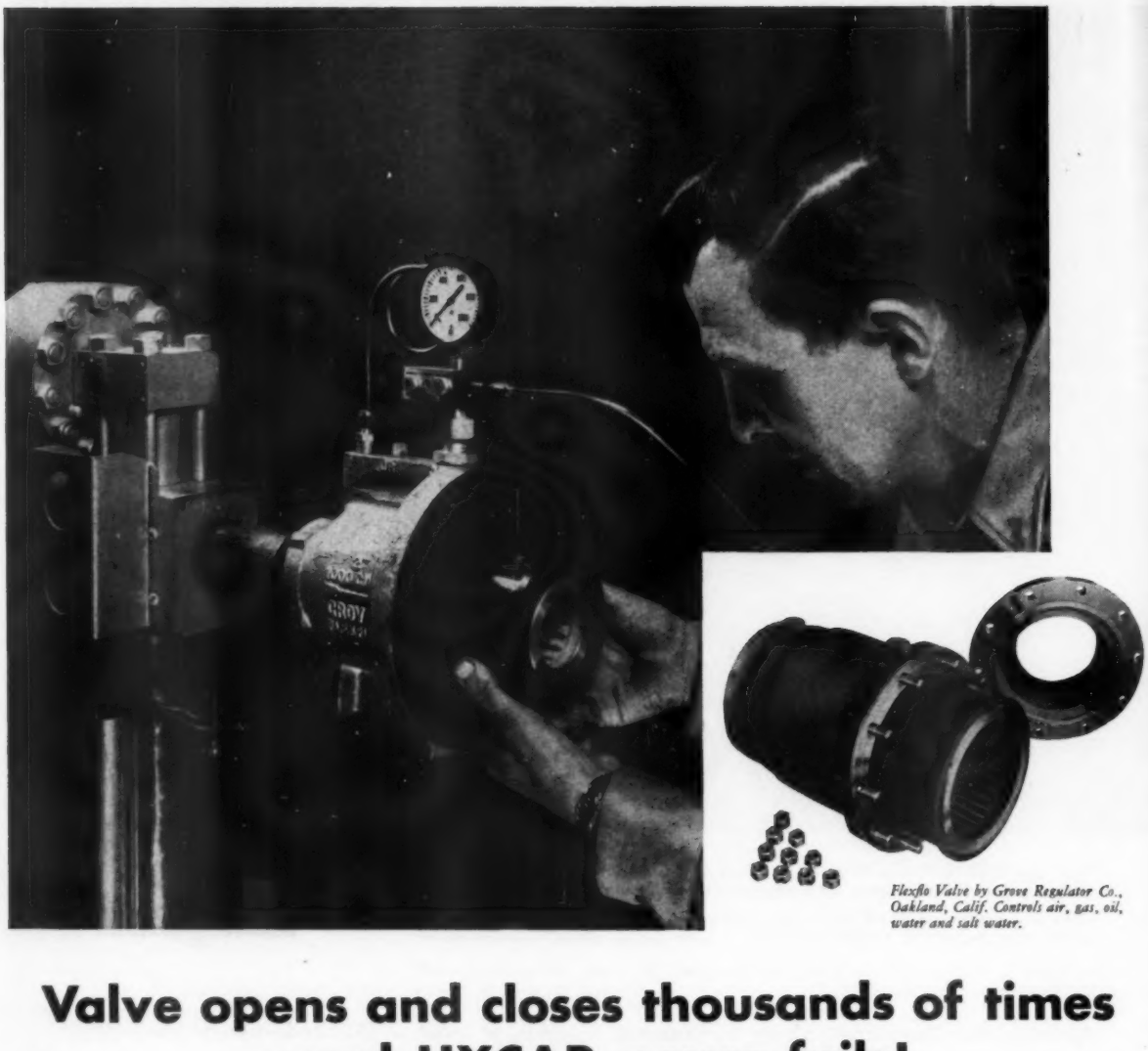
XUM



Flexflo Valve by Grove Regulator Co., Oakland, Calif. Controls air, gas, oil, water and salt water.

Valve opens and closes thousands of times —and HYCAR never fails!

HERE'S an oil field "dream" valve come true—with Hycar rubber's help! For the pressure in the line does all the work, opening it with a smooth, rolling action, or closing it with a bubble-tight seal. It can be operated by simple, remote control—works continuously for years without trouble.

The only moving part is a sleeve made of Hycar American rubber, around the slotted cylindrical core. Because of the valve's unique design and this Hycar tube, many of the faults common to conventional valves are eliminated. The valve can never stick open or closed. It can never be wedged open by foreign matter, for the tube closes around such particles. No stem or seat to wear. No packing or lubrication is needed.

Hycar was chosen for the sleeve because the tube material had to have the greatest elasticity, strength, density and resistance to cold flow possible. Hycar possesses resistance to permeability and the deteriorating effects of a variety of fluids. And Hycar's resistance to abrasive and erosive action of fluids and slurries cinched the deal!

Perhaps Hycar can help you improve or develop products—increase your profit possibilities. For versatile Hycar resists oil, gas, heat, weather and wear—has many other advantages. For technical bulletins, please write Dept. HE-6, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco.

Need age-resistance? Hycar has it!—plus extreme temperature-resistance and *more* advantages.

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Extra Day in Texas

Railroad Commission to permit June increase of 140,500 bbl. daily over May; part to go toward increasing stocks

Roy F. Carlson

AUSTIN.—Texas producers of crude oil may operate on the basis of 18 full producing days in June, one day more than in May, under the June allowables order of the Texas Railroad Commission.

This change in effect will raise June calendar-day production to 2,366,376 bbl., an increase of 140,500 bbl. daily over May. Railroad Commission estimates of natural gasoline and distillate production are 305,089 bbl. daily, making the total Texas allowable production of petroleum liquids 2,671,465 bbl. daily.

Before the meeting Texas crude purchasers had nominated for 2,374,211 bbl. daily, only 7,551 bbl. daily more than May nominations, the nominations nearly always being larger than actual production in any given month. The Bureau of Mines estimated that June demand for Texas crude oil will be 2,120,000 bbl. daily, an increase of 30,000 bbl. over May estimates.

Demand for the four principal refined products has been estimated as being up 8.5 per cent over last year, with the demand for gasoline alone being up 5.5 per cent.

Although nominations would indicate that June demand for Texas crude would be about the same as for May, the commission apparently felt that stock levels can be built up to some degree, and that forecasts of increased demand for crude and products will materialize.

Stocks picture.—Testimony of the heads of major oil companies indicated that present stocks of crude oil, 242,500,000 bbl. according to May 6 Bureau of Mines figures, were a little below the desirable level. Most of these officials suggested a minimum level of 245,000,000 bbl.

Estimates of the desirable level of crude-oil stocks as of April 1, submitted by 14 major compasies at the hearing, ranged from 240,000,000 to 268,000,000 bbl., and averaged 248,300,000 bbl. Estimates of the desirable level for September 1 ranged between 245,000,000 and 268,000,000 bbl., and averaged 249,000,000 bbl.

The desirable level for stocks of gasoline on April 1 was variously set between 122,500,000 and 132,500,000 bbl., the average figure being 130,000,000 bbl. For September 1 the desirable level of gasoline stocks was given from 92,500,000 to 120,000,000 bbl., and the estimates averaged 102,400,000 bbl.

CALENDAR-DAY ALLOWABLE, JUNE 1950

District	Calendar-day allowable: May 13, 1950	Calendar-day allowable: June 1950	June change compared with May 13, 1950, allowable
1	30,250	31,139	+ 889
2	126,130	136,297	+ 10,167
3	401,419	424,704	+ 23,285
4	203,704	216,646	+ 12,942
5	33,045	35,610	+ 2,565
6*	86,501	92,370	+ 5,869
6†	263,436	286,072	+ 22,636
7-B	82,675	85,567	+ 2,892
7-C	55,477	58,345	+ 2,868
8	654,244	705,099	+ 50,855
9	179,374	184,892	+ 5,518
10	109,621	109,635	+ 14
Total	2,225,876	2,366,376	+140,500

*Outside East Texas field. †East Texas field.

The commission had asked for estimates of the desirable level of heating oils on April 1 and September 1, but many of the companies said that October 1 would be a better date for the end of the motoring season and the beginning of the heating season, and some testified that fuel-oil stocks should increase until November 1.

Some of the companies gave no estimates of the desirable levels of heating-oil stocks. Some grouped all fuel oils together, some separated heating oils from residual, and others gave separated estimates for distillate and kerosine. For these reasons and because of the different dates used it was impossible to secure a representative figure for desirable levels of heating oils.

In general, however, it was suggested that stocks of distillate fuel oil should be 35,000,000 or 40,000,000 bbl. in the spring and between 75,000,000 and 95,000,000 bbl. in the fall. For residual stocks the suggestions were for about 40,000,000 bbl. in the spring and 55,000,000 to 60,000,000 bbl. in the fall.

Increase favored.—In response to questioning by Railroad Commissioner Thompson most of the company heads recommended an increase in Texas allowables. Hines Baker, president of Humble Oil & Refining Co., suggested however, that the commission wait before granting an allowable raise. Recommendations for increased production ranged from 1 to 3 days. Harry Hasson, vice president of Sinclair Oil & Gas Co., thought that industry stocks should stand at 268,000,000 bbl., the highest of any recommended. This high level he said was necessary to produce more residual fuel oil.

But the importing companies gave negative answers to the key question of whether they would reduce imports if domestic production is raised (see story on page 81). The importers said that their figures are firm and could not be changed, due primarily to contractual commitments.

The accompanying table shows the June production allowables for the various Railroad Commission districts.

ASSOCIATIONS

P.E.S.A. Meeting

The fifteenth annual membership meeting of the Petroleum Equipment Suppliers' Association will be held June 25-27 in the Greenbrier Hotel, White Sulphur Springs, W. Va.

The meeting previously had been scheduled there a week earlier.

NEXT WEEK

Exploration Problems in Canada.—On-the-spot report describing unique problems encountered by geophysical parties in the Canadian bush country, by the Journal's geological editor.

Producing Sour Crude?—Continental Oil Co. Engineers D. A. Shock and J. D. Sudburg give data for (1) corrosive environments, and (2) methods of mitigation.

Cathodic Protection in Refineries.—C. R. Draughon, Jr., and E. B. McNeil present designs employed at Baton Rouge refinery of Esso Standard Oil Co. for cathodic protection for open-box-type coolers.

Eastern Water-Flood Operations.—R. R. Vincent and K. P. Huffman, Sohio Petroleum Co., have collected up-to-date data for secondary-recovery projects in Illinois, Indiana, Kentucky, Ohio, Michigan, and West Virginia.

Shooting Oil and Gas Wells.—Research developments on this subject, based on experimental studies by the U. S. Bureau of Mines, are reported by five of the Bureau's engineers.

Floating Compressor Plants.—J. B. Goodrich, Shell Oil Co., Houston, describes unique plants especially designed for Louisiana Gulf Coast areas.

XUM

Record Production

Foreign fields produced at all-time high of 3,813,000 bbl. daily in March; Middle East, Venezuela report gains

Dahl M. Duff

PRODUCTION of crude oil in foreign fields rose to a new record high level in March.

Total foreign output, excluding the Russian-controlled areas, increased to approximately 3,813,000 bbl. daily. This daily average was 3.3 per cent greater than the previous month and nearly 17 per cent above March 1949.

The record production was due to sharp gains in Iran and Kuwait in the Middle East and by a partial recovery in Venezuela from its low output in February. Production increases also were reported in many of the smaller oil countries.

World total unchanged.—Contrasting with this high level of foreign production was another decline in output in the United States. This decrease amounted to about 118,000 bbl. daily, or 2.5 per cent, compared to February.

As a result, the indicated world production total, including both foreign and United States output, was virtually unchanged. In March, United States production represented slightly less than 51 per cent of the world total, compared to more than 56 per cent a year ago.

This declining ratio of United States to foreign production reflects several factors, among them the current high rate of imports into the United States, continued rapid growth of foreign demand, and use of foreign production and refining facilities to meet foreign requirements.

Compared with March 1949, world production this past March showed an increase of about 257,000 bbl. daily, or 2.8 per cent. United States production in March was some 375,000 bbl. daily, or 7.2 per cent under the year-earlier figure.

The more accurate foreign production index is that which excludes Russia and Eastern Europe for which no reliable data are available. At 3,813,000 bbl. daily in March, this total represented a 16.6 per cent gain over March 1949.

Western Hemisphere. — Venezuelan crude output dropped considerably in February when the government requested cutbacks because of the campaign for additional restrictions on imports into the United States. In March, Venezuela's production was back up about 68,000 bbl. daily, or 5.2 per cent over February, but was still considerably under the all-time record of 1,464,900 bbl. daily in January.

Venezuela's April production figures, since reported, show a further rise. Output the week ended April 24 was, for example, 1,437,667 bbl. daily.

Foreign production in the entire Western Hemisphere in March gained about 5 per cent over February. Venezuela was the main factor in this increase, but other important gains were reported in Mexico, Canada, and Colombia. Mexican production is now approaching 190,000 bbl. daily, and is nearly 20 per cent above the early months of 1949.

A relatively large increase was shown in Brazil's small indigenous crude production in March. Of the month's total, practically all came from Candeias field. Brazil's Conselho Nacional do Petroleo will step up output considerably with the completion of the Bahia refinery now under construction. In Bolivia, production was reported to have dropped off in March largely as a result of washouts interfering with the transportation system.

Europe. — Western Germany continued outstanding in Western Europe's crude-oil production. Another small increase was made in March, bringing the daily average to about 41 per cent above a year ago. Italy's government oil agency, AGIP, is getting an intensive exploration program under way, but this has not as yet been reflected in the country's small output. French production is expected to show some increase later as a result of recent discoveries in the south of France.

Middle East. — In the Persian Gulf, Iran's production went above 700,000 bbl. daily in March to establish a new record. The March daily average of about 706,500 bbl. was some 12 per cent above the previous month and more than 25 per cent greater than a year ago. Production in Kuwait similarly set a new record at about 311,600 bbl. daily in March, its highest rate since April 1949. Kuwait's March production was about 16 per cent above February and nearly 28 per cent above March 1949.

The increased production in these two countries, particularly Iran, apparently results directly from the policy instituted in February by the British Government of replacing dollar-oil imports with sterling oil in

CRUDE-OIL PRODUCTION
(Thousands of barrels daily)

Country—	March 1950	Prev. month	March 1949
Western Hemisphere:			
Argentina	61.0	61.0	61.7
Bolivia	1.0	0.5	0.8
Brazil	1.2	0.5	0.3
Canada	76.0	64.1	54.3
Chile	1.5	1.9	.....
Colombia	87.0	80.4	84.0
Cuba	0.4	0.4	0.1
Ecuador	7.2	7.2	7.2
Mexico	188.0	187.8	156.9
Peru	41.0	41.0	40.1
Trinidad	57.0	57.0	57.0
Venezuela	1,386.6	1,318.8	1,155.5
Total	1,907.9	1,820.6	1,618.1
Europe and Africa:			
France	1.3	1.3	1.1
French Morocco	0.8	0.8	0.8
Germany	20.6	20.4	14.6
Italy	0.2	0.2	0.2
Netherlands	15.0	15.5	11.4
Egypt	42.5	43.8	43.0
United Kingdom	1.0	0.9	0.9
Total	81.4	82.9	72.0
Middle East:			
Bahrein	29.8	30.3	29.8
Iran	706.5	629.8	565.9
Iraq	113.1	114.5	64.2
Kuwait	311.6	268.3	243.7
Qatar	35.0	26.6	.....
Turkey	0.7	0.7	.....
Saudi Arabia	411.5	496.4	489.8
Total	1,608.2	1,566.6	1,393.4
Other Asia:			
British Borneo	77.0	77.0	60.3
Burma	0.5	0.5	0.5
China	1.5	1.5	1.8
India	5.5	5.5	5.3
Indonesia	120.0	122.5	109.6
Japan	5.2	5.2	3.4
New Guinea	4.6	4.6	4.4
Pakistan	1.0	2.5	1.6
Total	215.3	219.3	186.9
Total foreign, less Russia and E. Europe	3,812.8	3,689.4	3,270.4
Estimated Communist-controlled areas:			
Austria	22.0	22.0	17.7
Romania	82.0	82.0	95.0
Russia	730.0	730.0	635.0
Other E. Europe	21.0	21.0	17.0
Total	855.0	855.0	764.7
Total foreign	4,667.8	4,544.4	4,035.1
United States	4,849.0	4,966.9	5,224.3
World total	9,516.8	9,511.3	9,259.4

Figures are authoritative for the more important producing countries of the Middle East, Europe, and the Western Hemisphere. In other cases, estimates have been made based on the performance of previous months.

TREND OVER THE LAST YEAR

	W. Hemisphere less U. S.	Middle East	Foreign less Russia and E. Europe
April	1,678.2	1,485.2	3,488.3
May	1,768.5	1,417.6	3,472.8
June	1,768.8	1,375.7	3,433.3
July	1,800.2	1,338.7	3,428.1
August	1,859.9	1,323.9	3,473.1
September	1,931.8	1,351.5	3,574.9
October	1,921.6	1,428.6	3,645.9
November	1,925.9	1,472.7	3,683.0
December	1,929.3	1,489.6	3,711.0
January	1,946.5	1,491.4	3,733.4
February	1,820.6	1,566.6	3,689.4
March	1,907.9	1,608.2	3,812.8

PRODUCTION OF MAJOR VENEZUELAN FIELDS

(10,000 bbl. daily or more)

Field—	March	Feb.
Eastern:		
Quiriquire	55,016	52,964
Oficina	27,386	25,697
Jusepin	25,263	26,069
Mulata	19,659	20,079
Nipa	24,943	18,258
Las Mercedes	17,673	16,552
Taman	10,457	11,806
Santa Barbara	21,777	20,871
Guara	53,376	51,844
Chimiri	28,497	31,299
Western:		
Cabimas	78,797	65,429
Lagunillas	381,853	359,647
Tia Juana	156,291	131,004
La Paz	143,607	149,965
Bachaquero	82,892	88,599
Mene Grande	46,976	48,642
El Cubo	11,578	11,870
Mara	78,371	72,144

the United Kingdom and other parts of the sterling area.

American dollar oil production in Saudi Arabia fell off in March by about 85,000 bbl. daily, 17 per cent below the previous month and 16 per cent under the output level of March 1949. The report of Arabian American Oil Co. also shows continued reduced runs at its Ras Tanura refinery, amounting to 72,075 bbl. daily in March.

Throughout the entire Middle East in March, crude production was at a record level with Iran and Kuwait offsetting the drop in Saudi Arabia. For the first time, output in the area rose to more than 1,600,000 bbl. daily. This daily average was 2.7 per cent above February and 15.4 per cent above March 1949.

Far East. — Complete and up-to-date information is still lacking on crude production in Southeast Asia. A London report said production of Attock Oil Co., Ltd., in Pakistan during the first quarter of this year dropped to 152,710 bbl. as compared with 203,561 bbl. the previous quarter. The fall in production was due to testing of Balkassar field, and output has now been restored to its normal rate.

EUROPE

Progress in Italy

Gasoline plant planned for Cortemaggiore field, Italy's most promising oil area; exploration to be stepped up

PLANS for construction of a $2,500,000 natural-gasoline plant in Cortemaggiore field in Italy's Po Valley were announced this week by a three-member Italian mission.

Members of the commission, representing Azienda Generale Italiana Petroli, the government-controlled oil company, said they planned to let a contract immediately with construction on the plant scheduled to begin in the near future.

Cortemaggiore is Italy's most important field and the first in the upper Po Valley with commercial oil production.

Plans for the natural-gasoline plant illustrate the increasing tempo of operations in the Po Valley, long thought by geologists to be a promising oil area.

Since the end of the war AGIP's exploratory efforts have resulted in the discovery of two valuable gas fields and the Cortemaggiore structure.

The gas fields, because of the high-B.t.u. content of the gas and their proximity to Italian industrial centers, are considered discoveries of considerable importance to the Italian economy.

Development drilling in the two gas areas has brought Italian reserves to more than 1 trillion cubic feet. Development drilling in the new oil field still is in progress.

Current operations.—Twelve rigs now are in operation in the Po Valley. Two of these are being operated on a contract basis by Santa Fe Drilling Co.

Six seismic crews, two of them Italian and four contracted from Western Geophysical Co., now are engaged in exploratory work. AGIP officials plan to increase the number of crews to 10 in the near future.

Cortemaggiore. — The discovery well was completed last June, flowing 175 to 200 bbl. daily of light-gravity crude from a depth of about 5,000 ft.

Since then a well has been completed on the eastern side of the structure with an initial production of about 600 bbl. daily.

Seven wells, averaging 6,000 ft. in depth, have been completed to date, and five rigs are now active. One of these is being used on a test projected below 10,000 ft.

The structure is a narrow east-west fold in the Upper Miocene, 7½ miles along its major axis and 2½ miles wide.

Cortemaggiore oil has an average gravity of 35.4° A.P.I. and a gasoline content of 37 to 40 per cent.

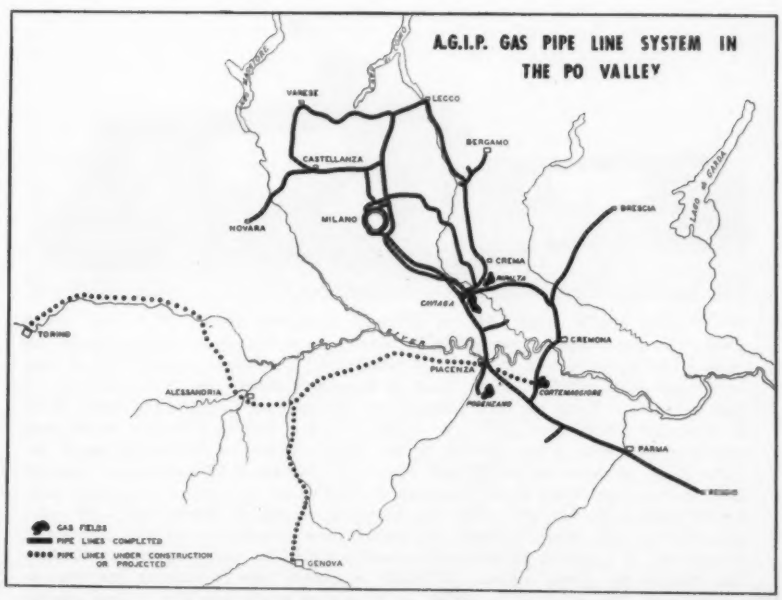
Caviaga.—This field was discovered in 1946, is located 25 miles southwest of Milan, and now has 17 producing wells ranging in depth from 5,000 to 6,000 ft. Pressures average about 2,200 psi. It is often referred to as Lodi field.

Production is in excess of 30,000,000 cu. ft. daily of dry gas, which is piped through 3½, 6, and 10-in. lines to Milan and the steel mills in Bergamo.

The gas has a high-B.t.u. content. Spacing in the field is 1,650 ft. on a triangular pattern. The productive area covers nearly 3,000 acres, and thickness of the pay zone is about 650 ft.

Ripalta. — This structure, 6 miles northeast of Caviaga, was discovered in 1948. In geological characteristics, productive capacity, depth, pressures, and quality of gas, it is almost a duplicate of Caviaga field.

Podenzano.—This field, including the small domal structure of San Gior-



Map of the upper Po Valley showing location of producing fields and pipe lines serving them.

XUM

gio, is 6 miles south of Piacenza. The discovery well was drilled in 1931 and was the first commercial gas production in the upper Po Valley.

By 1937 the field was pretty well drilled, with 30 wells completed in the Messinianan (Middle Miocene) at depths from 2,000 to 4,000 ft. The San Giorgio structure has 14 wells.

The entire Podenzano area at present is producing only 500,000 cu. ft. of gas per day.

The company.—AGIP is the only company which has conducted extensive exploration and drilling work in Italy.

Because of its preponderant government ownership and its favored position under the present mining law, it practically has a monopoly on the Italian oil industry. It holds extensive concessions in the Po Valley, where it has done exploratory work since shortly after its organization in 1926.

The government owns 60 per cent of the stcok of AGIP, and the remainder is owned by insurance companies, banks, and other business enterprises in which the government also is part owner.

Before the war the company operated in Albania, Romania, and Iraq. Since the war it has concentrated its efforts on development of concessions in Italy.

Active management of the company is in the hands of Prof. M. Baldrini, president; Hon. E. Mattei, M.P., vice president in charge of exploration and development; and Count E. Carafa D'Andria, general manager.

No Agreement

I.P.C., Iraq officials drop talks on concession terms

OFFICIALS of Iraq Petroleum Co., Ltd., and the Iraq Government have failed to reach an agreement over Iraqi demands for revision of concession terms, including higher royalty.

The Baghdad negotiations were postponed indefinitely a week after they opened. H. S. Gibson, I.P.C. managing director, and other company officials left for London. Baghdad reports described the talks as "a failure."

The Iraq Government is asking that half of the capacity of Middle East Pipelines, Ltd., be allocated to Iraqi oil, and that the Basrah and Mosul production be moved through an Arab port on either the Mediterranean or Persian Gulf. The Iraqi economics minister, in a statement to his parliament, said the discussions were postponed because the companies would not meet the government's "most vital demands."

Issues also included the possibility of increasing royalties and raising production and whether payments should be calculated on the basis of the cost of gold in the free market. It was reported that in earlier discussions of the problem with the government, the company raised the question of the closing of the Kirkuk-Haifa pipe line. This outlet was shut 2 years ago because of the Israeli-Arab strife.

The Iraq Government has urged that this question be kept separate from other matters to be settled. On the other hand, the company was said to be anxious to negotiate all outstanding issues with the government as a whole. No agreement was reached last year in London on account of this difference of position.

The Iraqi are seeking to revise the concessions held by I.P.C. and its subsidiaries, Basrah Petroleum Co., Ltd., and Mosul Petroleum Co., Ltd., to include the following:

An increase in the present royalties of 4 shillings gold per ton (about 22 cents per barrel).

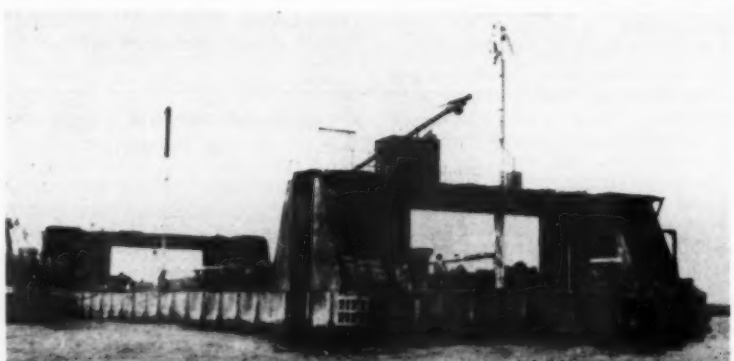
Calculation of royalty on the basis of the cost of gold in the open market instead of on gold-standard rates at the time of payment, as at present.

At least doubling of production by the Iraq company.

Replacement of foreign labor by the three companies as far as possible with Iraqis and the training of Iraqi nationals in Britain in petroleum engineering.

These give the principal demands of the government. Over-all settlement of the differences involves various other problems, such as the question of the rapidly developing Basrah area.

I.P.C. is moving ahead with plans to construct a 556-mile big-inch line from Kirkuk to Banyas on the Syrian coast. This project will allow Iraq production to be increased considerably. It was announced recently in Long Beach, Calif., that arrangements had been made for the delivery of 200,000 tons of pipe to I.P.C. from Consolidated Steel Corp., Maywood, Calif.



AFTER 9,000 MILES.—This 1,000-ton pierhead, measuring 200 by 60 ft., was towed 9,000 miles from England and placed in service as a floating oil dock in South Sumatra. The pierhead was once part of "Mulberry," the famous harbor built to help land troops and supplies on the coast of Normandy during the Allied invasion. It was towed by a Dutch tug from Southampton via the Suez Canal to the Banka Strait in Indonesia. Heretofore 9,000 and 12,000-dwt. ton tankers carrying crude from Lutong in Sarawak, British Borneo, to the Shell refinery at Pladjoe in South Sumatra were restricted on this 700-mile trip to an average of 60 per cent of capacity load because the Moesi River approach to Pladjoe is too shallow to permit fully loaded tankers of this size. With the pierhead moored at Muntok Bay, 70 miles from Pladjoe, fully loaded ocean going tankers now transfer part of their cargoes at Muntok Bay to a special shallow-draft vessel assigned for shuttle service to Pladjoe. This lightens the larger tankers sufficiently to enable them to pass up the river to the refinery. The pierhead is shown on its arrival at Muntok Bay. (Shell photo.)

Russian-Iranian Dispute

Russian charges that the Iranian Government had employed American oil experts who were making aerial photographs near the Iranian-Soviet border were denied by Iran in a diplomatic exchange between the two governments last week.

Russia protested that the surveys made in connection with oil exploration were of military significance, and endangered her security. The Russian note mentioned an Iranian Oil Co., Ltd., and said this organization was engaged in aerial photography, topographical surveys, and geological studies in northern Iran.

The Iranian reply said no aerial photographs had been made but that some were planned in connection with the country's 7-year economic-development program. These, it said, would be replaced by land photographic missions. Iran assured Russia

no foreign nationals would be allowed to photograph the border area.

The area involved in the protest has long been the scene of occasional disputes between the two countries. Iran has indicated it will grant no further concessions other than that now held by Anglo-Iranian Oil Co., Ltd., in the southwestern part of the country, and the Iranian Oil Co. referred to by the Russians presumably is a government or wholly Iranian organization.

LATIN AMERICA

Optimistic View

First quarter better than expected, Proudfit says

THE outlook for Creole Petroleum Corp., major Venezuelan producer, has improved considerably in recent months. This feeling was expressed in a discussion of the company's operations by A. T. Proudfit, president, at the stockholders meeting last week in New York.

First-quarter demand was above expectations, and the company is confident it will be able to retain a good portion of the increase in its outlets, some of which was due to the coal strike and moderately cold weather in February and March. As a result, Proudfit said, production will probably be as high or higher than the 591,095 bbl. daily in 1949. First-quarter output average 617,000 bbl. daily.

Increased demand in the Western Hemisphere may overcome the loss of the company's European markets by the time the Eastern Hemisphere is generally self-sufficient in oil. Proudfit said the company had expected to lose most of its Eastern Hemisphere markets a year or two hence, but that the British import restrictions inaugurated early this year came prematurely.

"These restrictions have not affected us as drastically as was first contemplated, but perhaps their full impact has not yet been felt because of the lack of refining facilities in the British area, though these facilities are now being built," he said. It is hoped, even in the long-range situation, that shipment of some specialties to Europe will be continued, he said.

Creole is primarily a producer of heavy fuel-oil crudes, and last year when the market and demand for residual dropped, operations were sharply curtailed. During the past year, Proudfit said, the company has taken such steps as were open to it to create customer interest in fuel oil, and it appears "our efforts have been reasonably successful."

Among the miscellaneous developments mentioned by the Creole president were:

The company will supply 10,000 to 20,000 bbl. daily of crude to Argentina over the next 12 months under the recent agreements between the Argentine Government and the American companies.

Discussions with the Ministry of Development toward a new formula for the calculation of exploitation taxes (royalty) more in line with current values of heavy crudes are still in progress. The company also is discussing with the government possible price increases for certain products marketed in Venezuela.

Strike Aftermath

The Venezuelan Government last week completed closing up Communist Party branches throughout the country as an aftermath of the week-long strike in the petroleum industry earlier this month.

Caracas reports said the Communist leaders had disappeared or gone underground practically overnight. The government accused Communists and Accion Democratica of fomenting the strikes.

The dissolution decree applied only to the Communist Party of Venezuela. Jesus Faria, described as leader of the Communists in the oil fields, was under arrest.

Industry activities were back to normal in the country with production at about 1,425,000 bbl. daily. Workers in all refineries and on tankers were reported to have also returned to their jobs.

1951 Solution

Refinery, pipe line to help meet rising Mexican needs

WASHINGTON.—Mexico's problems of oil distribution will be corrected by 1951 with the completion of refinery and pipe-line projects now under way, it was declared last week by Sen. Antonio J. Bermudez, director general of Petroleos Mexicanos.

In a statement issued through his Washington information office, Bermudez pointed out that Mexico's oil consumption has increased 205 per cent in the past 12 years while United States demand in the same period has increased 80 per cent, reflecting the great industrial and agricultural development which is taking place in Mexico.

"The phenomenal rate of increase of domestic demand has placed a heavy strain on supply and distribution facilities, causing occasional shortages in some areas of the country. In addition, there have always existed the enormous difficulties in transport, due to topographical extremes between the oil-producing zones and the zones of principal consumption. But consistent progress is being made in supplying the national market. Last year Pemex distributed a 12 per cent greater volume of oil products than in 1948 and a 21 per cent greater volume than in 1947."

The greatest immediate benefit, Bermudez said, will come from the new Pemex refinery now nearing completion at Salamanca and the 200-mile pipe line which will supply it from Poza Rica field. The refinery will add 30,000 bbl. daily to the Mexican products supply.

"While the new installation will raise the refining capacity for the country as a whole by 17 per cent, its key significance lies in the fact that it will step up refinery output in the high central zone, where principal domestic demand is centered, by 60 per cent," Bermudez explained.

AFRICA

Drilling Pickup

French development work in Algeria to be speeded up

FRENCH interests are intensifying the development of the thus-far minor production in the Sidi Aissa area of northern Algeria.

About 130 bbl. daily is now being produced from 10 of the 14 wells which have been drilled to an average depth of about 1,000 ft. A small topping plant of about 280 bbl. daily capacity has been installed at d'Oued Diemen to process the oil.

The 1950 program calls for drilling a total of nearly 40,000 ft. against the slightly more than 10,000 ft. completed in 1949. Plans are for enlarging the refinery to about 750 bbl. daily this year. Storage capacity is to be increased from about 6,200 bbl. to about 16,000 bbl. by the end of the year.

The work is being carried out by Soc. des Petroles d'Aumale, in which ownership is shared equally by Soc. Nationale de Recherches et d'Exploitation des Petroles en Algerie (French and Algerian governments) and Soc. des Raffineries de Petrole d'Algerie, a private company.

Two producing formations have been found, one 600 to 1,000 ft. and the other at about 2,000 ft. The present production from the upper zone is a high-quality crude with some 30 per cent of 42-octane gasoline, 12 per cent of kerosine, and 20 per cent of heavy oil.

First drilling operations were carried out in this area more than a year ago, and in February 1949, a well went to about 3,100 ft. to discover the two horizons.

The Algerian development is being carried out with government support as a part of the general program aimed at extending the present minor production of oil in French territory. Although there have been no outstanding discoveries to date, there appears to be considerable optimism over the possibilities in Paris.

XUM

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The pump has three 4¾" plungers on one side and three 3½" plungers on the other side. It is manifolded so that both sides provide high volume at low pressures: the 4¾" side for medium pressures; and the 3½" side for maximum volume at high pressures. Special manifolding allows you to blank out a cylinder on either side and still operate the pump, thus giving added insurance the job will be completed.

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PERSONALS

Gas Executive

Kayser has headed El Paso Natural Gas Co. since 1929

A VETERAN of 21 years in the natural-gas industry is Paul Kayser, who has been president of El Paso Natural Gas Co., Houston, since 1929.

A native of Tyler, Tex., Kayser is a graduate of Baylor University, Waco, Tex., class of 1909. He became president of El Paso Natural in 1929, after practicing law from 1913. The El Paso company is one of the country's larger gas transporters, its system comprising more than 4,500 miles of transmission lines with delivery capacity in excess of 965,000,000 cu. ft. daily.

Kayser is also president of Western Natural Gas Co., a director of the National Bank of Commerce in Houston, and a vice president and director of the Independent Natural Gas Association of America.

A member of the Episcopal church, Kayser also belongs to the University Club of Chicago and the Recess Club of New York. He has written numerous articles in trade publications on natural-gas production and transportation, and the problem of flare gas and its relation to reserves.

J. P. Warren, Dow Chemical Co., Freeport, Tex., has been elected chairman of the South Texas Section, American Society of Mechanical Engineers. Other officers include: **J. W. Mason,** Combustion Engineering-Superheater Co., Houston, vice chairman, and **Wilson J. Pais,** Foster Wheeler Corp., Houston, secretary-treasurer.

Edwin L. Hall, director of the American Gas Association Laboratories at Cleveland and Los Angeles, has been appointed an assistant managing director of the association. He joined A.G.A. in May 1945 as coordinator of gas-production research and was appointed director of the laboratories in November 1947.

Richard Brewer, Atlantic Refining Co., Shreveport, was recently elected president of the Ark-La-Tex Geophysical Society. Others elected include: **R. B. Baum,** Seismograph Service Corp., vice president; and **B. B. Burroughs,** Arkansas Fuel Oil Co., secretary-treasurer. Brewer served as vice president of the group last year.

Raymond Chorney, formerly division geologist at Casper, Wyo., for Pacific Western Oil Co., has joined Union Oil Co. of California as district geologist there.

Darby Hand has resigned as district geologist for Shell Oil Co. and has joined **Page Jenkins** in forming a consulting geological firm, with offices in Casper, Wyo.

Ben Brooks, geological scout for Samedan Oil Co., was recently elected secretary-treasurer of the Ardmore, Okla., Petroleum Club, succeeding **Nelson Newman,** of Phillips Petroleum Co.

O. C. Mudd, senior corrosion engineer for Shell Pipe Line Corp., Houston, recently received the F. N. Speller Engineering Award for 1950 from the National Association of Corrosion Engineers. The award, which signifies outstanding achievement in corrosion engineering, was presented to him for his contributions to the development of a method by which corrosion surveys along pipe lines can be conducted without contacting the buried pipe.

Pat C. Lowe, Dayton, Tex., has purchased the Tri-County Oil Co., originally known as the D. C. Curry Oil Co. The firm will now be known as Lowe Oil Co., and Lowe will be associated with his son, **Vernon Lowe.** They will continue to serve Hardin, Liberty, and Chambers counties, Texas, with headquarters at Dayton.

DeLasso Loos, with the firm of Cool & Stilley, Midland, Tex., was recently elected chairman of the Permian Basin Section, National Association of Corrosion Engineers, succeeding **Aaron Gensberg,** of Gulf Oil Corp., Odessa, Tex. Others elected include: **E. B. Ray,** Republic Natural Gas Co., Midland, and **E. O. Kemper,** Permian Enterprises, Odessa, vice presidents; and **C. O. Bundrant,** Western Co., Midland, secretary-treasurer.

D. M. S. Langworthy has been elected to the board of directors of Kuwait Oil Co., Ltd., owned jointly by Gulf Oil Corp. and Anglo-Iranian Oil Co., Ltd. The company has a large producing concession in Kuwait, Persian Gulf. He succeeds **W. B. Pyron** who retired in April. Langworthy has also been elected a director of Gulf Exploration Co., Ltd. (Great Britain) and Eastern Gulf Co., Ltd. (Great Britain). His offices are located in London, and he reports to **C. W. Hamilton,** vice president in charge of foreign operations of the Gulf Oil Corp., New York. Langworthy for several years was employed in the executive department of the Gypsy division of Gulf Oil Corp., Tulsa. During the war he attained the rank of lieutenant colonel and became secretary of the Army-Navy Petroleum Board in Washington, D. C. He was assigned several special petroleum tasks during that period. Following discharge from the Army, he became an assistant to Pyron with headquarters in London.

LANGWORTHY

H. C. Smith, president of American Oil Co., was recently presented two awards given to his company in recognition of its outstanding achievement bringing about a better understanding of the American way of life, by the Freedom Foundation.

D. A. Hulcy, Dallas, president of Lone Star Gas Co., was one of six named vice presidents of the United States Chamber of Commerce at the recent annual meeting in Washington, D. C., last week.

John C. Maher, supervising geologist for the U. S. Geological Survey, has been elected president of the Tulsa Geological Society. Other officers include: **Daniel A. Busch,** Carter Oil Co., and **Rex J. McGehee,** Shell Oil Co., vice presidents; and **Gerald A. Northrip,** Pure Oil Co., secretary-treasurer.

Dr. Gustavo Thery Fombona, assistant director of the Hydrocarbons Bureau, Venezuelan Ministry of Development, returned recently to Caracas from a trip to Mexico and the United States. He attended the Petroleos Mexicanos Technical Convention in Mexico City and later went to New York.

Clarence S. Beesemyer, executive vice president of General Petroleum

XUM

PERSONALS

Corp., Los Angeles, has been named an honorary referee for the 1950 Indianapolis 500-mile racing event.

H. N. Oldham, Southern Union Gas Co., has been made assistant operating manager and transferred from Carlsbad, N. M., to Dallas, home office of the firm. He was previously industrial engineer at Santa Fe and served 13 years as district manager at Carlsbad.

Bob Clark, Shell Oil Co., Midland, Tex., has been named secretary-treasurer of the North Basin Pools Engineering Committee, which is composed of 156 operators in 15 pools on the north side of the Permian basin of Texas. **V. E. Cottingham,** Midland, is chairman of the committee.

Thomas J. Astle, tool pusher for Fred M. Manning, Inc., Denver, has been transferred to Midwest, Wyo., from the Lance Creek, Wyo., area, in the same capacity.

John E. Stephen, vice president and general manager of Southern Oil Sales Co., has transferred from Dallas to Corpus Christi, Tex.

Rep. Vernon McDaniel, Wichita Falls, Tex., is one of the incorporators of the newly formed Quinco Oil Co., which recently was granted a Texas state charter. Other incorporators include **Melvin T. Hansen** and **Jay J. Gamlich.**

Robert H. Dickey, geologist for Pure Oil Co. at Worland, Wyo., has been named division reservoir geologist for the company at Billings, Mont.

Robert E. Stripling, independent oil operator, has established offices in Midland, Tex.

M. T. Stevens, manager of the Calgary, Alta., refinery for British American Oil Co., Ltd., has been transferred to Edmonton and appointed construction manager of the new company refinery to be built near that city.

J. B. Higginbotham, Sun Oil Co. foreman at Premont, Tex., has been transferred to Snyder, Tex., and **E. A. Kistenmacher,** junior petroleum engineer, has been transferred from Brookhaven, Miss., to Snyder.

Harold G. Osborn, vice president in charge of manufacturing for Continental Oil Co., Ponca City, Okla., has been named manager of the company's operations at Ponca City, in addition to his other duties. He has been with Continental since 1921 and has served in various capacities in the manufacturing division. Osborn was named manufacturing division vice president in 1946.

George W. Boulter, Metaline Falls, Wash., has joined Northern Pacific Railroad's staff as geologist at Billings, Mont.

Richard K. Lisco, seismograph party chief for Intermountain Exploration & Engineering Co., has been transferred to the Regina, Sask., Canada, area.

Joseph Teichman has resigned as geologist for Atlantic Refining Co. and has become an independent consultant in Tulsa.

T. P. Slaughter, with Glenn McCarthy Interests, Houston, has been transferred to Billings, Mont., where he will supervise drilling of a wildcat test in Big Horn County.

Tom Bolack, Aztec, N. M., formerly field superintendent for Kutz Canyon Oil & Gas Co., has resigned and entered business for himself, with headquarters in Farmington, N. M.

C. L. Franke, engineer for Gulf Oil Corp. at Hobbs, N. M., has been transferred in a similar capacity to Lyons, Kans.

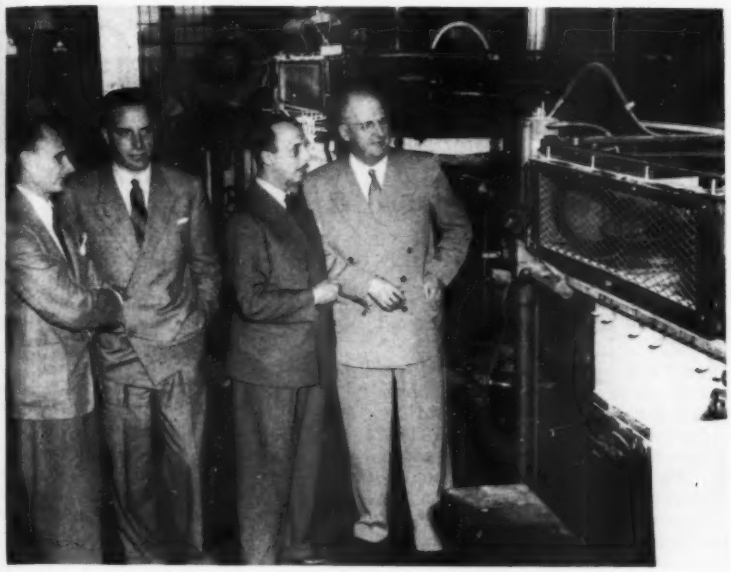
R. C. Clark, refinery manager for Utah Oil Refining Co., has been elected a director of the company, replacing **M. J. Greenwood,** who asked to be relieved of his duties. Clark joined the company as an engineer in 1922. He is a mechanical-engineering graduate of Cornell University.

Frederick V. Miles, engineer for Gulf Oil Corp. at Seminole, Okla., has been transferred to Hobbs, N. M., in the same capacity.

E. L. Fipps, geologist for Plymouth Oil Co., has been transferred to Evansville, Ind., where he will supervise operations in the Tri-State area.

NEW OFFICERS.—These are the 1950-51 officers of the Pacific Coast District of the American Petroleum Institute's Division of Production, elected during the district's meeting in Los Angeles May 11-12. Front row, left to right, are C. T. Reichert, National Supply Co., treasurer; N. B. Standing, California Research Corp., vice chairman of the advisory committee; E. C. Babson, Union Oil Co. of California, district chairman; and J. P. Shea, Richfield Oil Corp., vice chairman for the San Joaquin Valley. Standing are D. B. Priest, General Petroleum Corp., vice chairman, coastal district; W. M. Lyles, Lyles Construction Co., vice chairman, Coalinga-Kettleman district; John Isaacs, Hillman-Kelley, Inc., arrangements chairman for the spring meeting; and H. F. Danberg, General Petroleum Corp., vice chairman, Los Angeles Basin district.

PERSONALS



ITALIAN VISITORS.—Members of a mission representing the Italian Government-controlled oil company, Azienda Generale Italiana Petroli, who are in this country to let contract for construction of a $2,500,000 natural-gasoline plant in the Po Valley, are shown with C. O. Willson, right, editor of The Oil and Gas Journal, examining one of the new presses in the Journal's mechanical department. Left to right: Prof. Giorgio Roberti, consulting chemist; Dr. Cesare Gavotti di Castellano, petroleum engineer; and Dr. Piero Verani-Bergucci, technical director. The three planned to visit oil installations in several parts of the United States before their return to Italy. (See International.)

Leroy White and **Bill Haney,** both of Los Angeles, have been engaged by The Texas Co. to go to Colombia as drillers for the firm's concessions in the Magdalena Valley area.

Norman Hardy, president of Richmond Exploration Co. in Venezuela, has moved his headquarters from Caracas to Maracaibo. **L. W. Henry** and **C. R. Cabrera** will remain in Caracas in charge of a branch office.

Walter Huff, mud engineer with Mene Grande Oil Co. in Venezuela, has been named manager of Northern Testing Laboratories, Ltd., in Edmonton, Alta., where he will supervise activities in western Canada.

J. W. Mitchell has been named superintendent in charge of construction of Phillips Oil Co.'s refinery and related installations in Venezuela. He will remain at company headquarters at Bartlesville, Okla., at present.

L. G. Williams has joined the staff of Ryan Oil Co. as geologist in the Evansville, Ind., office.

Wayne H. Denning, for the past 6 years supervisor of Brazilian operations for United Geophysical Co., Inc., has been named supervisor for the Mid-Continent area and has returned to the United States. He also supervised the company's operations in Puerto Rico during his stay in South America.

J. W. Henderson, district geologist for National Associated Petroleum Co., has assumed duties in the geological department at Washington, Ind.

SHIFTS

Robert D. Kent, engineer, The Texas Co., Long Beach to Wilmington, Calif.; **Edwin C. James,** engineer, Shell Oil Co., Los Angeles to Long Beach, Calif.; **Bruce Echo Hawk,** Century Geophysical Corp., Cuba, N. M., to Pawnee, Okla.; **R. C. Cashin,** engineer, Phillips Petroleum Co., Marshall to Cotella, Tex.; **William P. Harvey,** Geophysical Service, Inc., Fulia to Plainview, Tex.; **William H. Wheatley,** engineer, Stanolind Oil & Gas Co., Andrews, Tex., to Tulsa; **Eugene Robert Manning,** engineer, Stanolind Oil & Gas Co., Brownfield to Iraan, Tex.; **Edgar O. McCutchen,** geologist, Gainesville, Tex., to Holyoke, Colo.; **R. C. Ledford,** engineer, McCarthy Chemical Corp., Winnie to Houston, Tex.; **L. G. Truby, Jr.,** Humble Oil & Refining Co., New Orleans, La., to Houston, Tex.; **George R. Helfrich,** engineer, Houdry Process Corp., Wilmington, Del., to Park Ridge, Ill.; **Charles R. Cunningham,** superintendent, Loffland Bros. Co., Homestead, Fla., to New Iberia, La.

W. G. Steed, engineer, Paul P. Steed, Wichita Falls, Tex., to Fort Worth; **Donald A. Morgan,** geologist, Warm Springs, Ga., to Mount Vernon, Ill.; **J. S. Harrold,** producer, Tyler, Tex., to Wilton, Conn.; **James E. Aber,** producer, Miami, Fla., to Houston.

DEATHS

Reginald G. Longcroft, chairman and managing director of Trinidad Central Oilfields, Ltd., died recently in London. He had been connected with the oil industry in Trinidad for the past 40 years.

W. Scott Lockwood, 80, Allegan, Mich., independent lease man, died May 10.

Albert R. Bradley, 59, retired vice president and assistant secretary of Shell Oil Co., died in San Mateo, Calif., May 12. He had been with Shell since 1920, serving as clerk and later as attorney. He was appointed vice president in June 1944 and retired January 1 of this year.

Spencer Kennedy, 81, veteran lease man for Chartiers Oil Co. in Michigan, died in Saginaw May 12.

Bernard Victor Pfeiffer, 63, gas engineer and manager of operations for United Gas Improvement Co., Philadelphia, died May 13.

Thomas B. Greer, 48, acid engineer for Dowell Incorporated, at Mount Pleasant, Mich., died May 11.

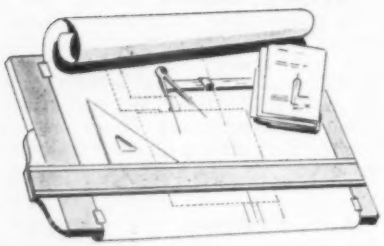
Harry Marker, 63, Tulsa, representative for Bignall & Keeler Tool Co., died May 22.

B. F. Melat, 86, Shreveport oil operator, died recently.

P. E. Blatt, 46, controller for Gulf Shore Oil Co., Houston, died May 17.

XUM

Applying New Techniques to Production Operations Through



JOB DESIGN

by John E. Daxon* and Roger Filson†

PRODUCTION operations can be systematically designed by the study of methods employed in performing work and by considering the time and activities involved in each element of a job. Job design is a means to improve work standards, eliminate hazards to safety, increase effectiveness of labor, and conserve the physical effort required to accomplish a job. It is also a means of improving the employe - supervisor relationship. Systematic job design in petroleum production operations can accomplish: (1) more effective coordination of working groups; (2) better planning of field operations and, (3) effective utilization of improved tools.

*Industrial Engineer, Phillips Petroleum Co., Oklahoma City, Okla. †Job Analyst, Phillips Petroleum Co., Oklahoma City, Okla. Presented at spring meeting, A.P.I. Division of Production, Casper, Wyo., April 1950.

There are often many ways in which a particular job can be done. For that reason, jobs can have different designs. Work may be efficient as a result of careful study and planning. Work may be inefficient because procedures are based upon accumulated past habits and customs. The efficiency of work is to be measured in terms of the physical effort required to accomplish it as well as in terms of cost.

Time and motion studies are a part of the general procedures employed in the modern technique of job design, but they are only a part of the general technique. Job design is not to be interpreted as a device for "speeding up," a device for placing additional burdens on labor, or a device for requiring unreasonable effort in accomplishing work. Petroleum-production operations are not to be considered as equivalent to the routine repetitive activity of assembly-line methods. Nevertheless, the basic principles of job design apply to any job, and, therefore, apply to the work methods in petroleum production.

Method study is relatively simple and straightforward. It is best accomplished in the ordinary course through

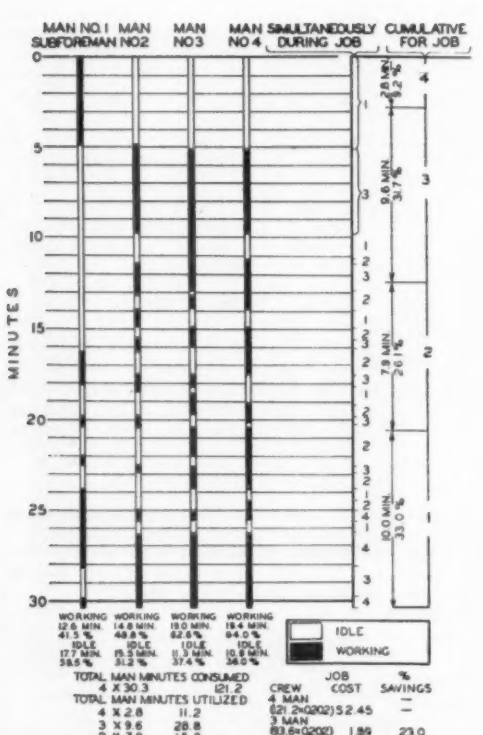


Fig. 1—Activity chart on four-man crew engaged in connecting water-input well.

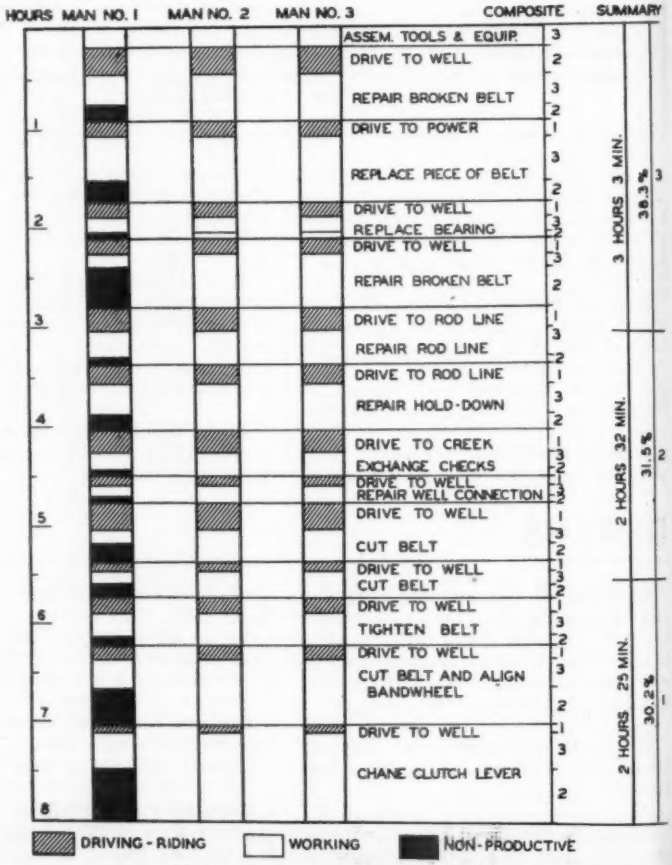


Fig. 2—Maintenance-crew activity chart on three men.

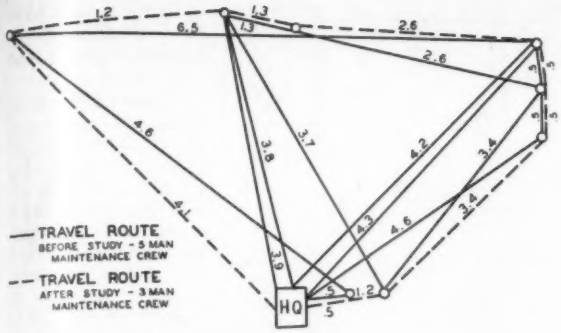


Fig. 3 — Method-improvement study on surface-equipment maintenance operations.

TIME SPENT EFFECTIVELY
TIME SPENT INEFFECTIVELY, DUE TO LACK OF KNOWLEDGE OR POOR PLANNING OF WORK
MIN.
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
2.50 MINUTES - DRIVE FROM TOOL HOUSE TO WELL
7.60 MINUTES - FIT BRACKETS ON ENGINE
2.60 MINUTES - DRIVE TO TOOL HOUSE TO REVISE BRACKETS PICK UP THREAD TAP AND SOCKET WRENCH
18.40 MINUTES - ENLARGE HOLES IN BRACKETS WITH WELDING TORCH
2.50 MINUTES - DRIVE TO WELL
.80 MINUTE - UNLOAD EQUIPMENT
7.50 MINUTES - INSTALL BRACKETS - NEED THREAD TAP AND SOCKET WRENCH
2.40 MINUTES - DRIVE TOOL HOUSE FOR THREAD TAP AND SOCKET WRENCH
3.05 MINUTES - LOOK FOR THREAD TAP AND SOCKET WRENCH
3.25 MINUTES - DRIVE LOCATE SPECIAL SWITCHER
1.60 MINUTES - BORROW SOCKET WRENCH FROM SPECIAL SWITCHER
3.50 MINUTES - DRIVE TO WELL
25.90 MINUTES - TIGHTEN BRACKETS AND BOLT ENGINE TO BASE
2.20 MINUTES - START WELL PUMPING AND ADJUST S.P.M.
.60 MINUTES - LOAD TOOLS AND EQUIPMENT
2.60 MINUTES - DRIVE TO TOOL HOUSE
86.80 MINUTES - TOTAL TIME
44.90 MINUTES OR 51.7% COULD BE ELIMINATED BY PROPER PLANNING AND INSTRUCTIONS.

Fig. 4—Activity chart on repair of engine mount.

the cooperative effort of a job analyst, the supervisor, and the workers directly employed on the job to be studied. The procedure is to determine the essential activities that must be performed, the time required to accomplish each activity, the proper sequence of activities, and the tools used compared to the tools available. The data in respect to the entire series of activities must then be studied and analyzed, and from that, there is produced a coordinated schedule of activities that permit the maximum accomplishment in the execution of any job. In that way, a job can be designed so that workmen may accomplish a job with the maximum conservation of time and physical effort.

Surface Maintenance Work

Surface maintenance operations can be improved by (1) determination of proper crew size, (2) elimination or reduction of travel time, (3) more adequate planning and instruction, and (4) substitution of tools for manual effort.

Crew size. — In many maintenance jobs the limitations of the work space prevent all members of a crew from working simultaneously. For this reason, the most economical crew size will be found to be the smallest crew which will provide the number of men necessary to meet the maximum simultaneous physical demands of any element of the work.

If a job requires three men to lift a heavy part into place, this fact dictates the minimum size crew. For example, a four-man roustabout crew was observed installing a 1-in. water meter between the end of a water line and a well-head connection on a water-input well, and placing a frost box around the well head and meter.

During this operation, due primarily to the limitations of the work space, the four men were occupied simultaneously less than 10 per cent of the time, and during 33 per cent of the time only one man was working.

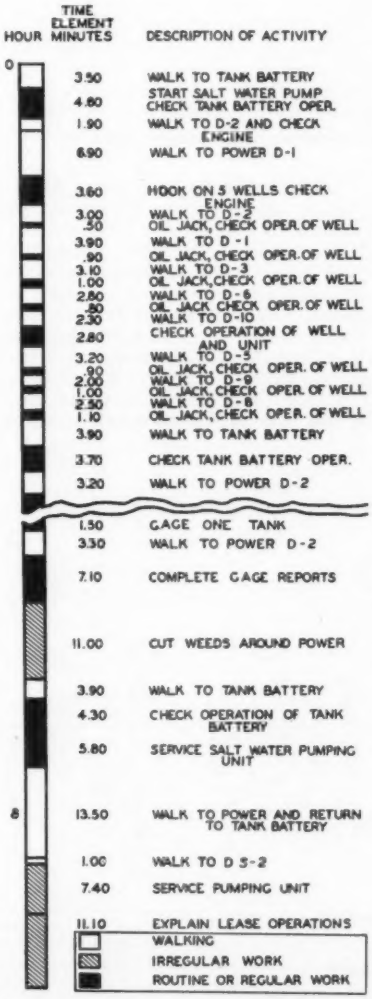

HOUR
TIME ELEMENT MINUTES
DESCRIPTION OF ACTIVITY
0
3.50 WALK TO TANK BATTERY
4.60 START SALT WATER PUMP CHECK TANK BATTERY OPER.
1.90 WALK TO D-2 AND CHECK ENGINE
6.90 WALK TO POWER D-1
3.60 HOOK ON 5 WELLS CHECK ENGINE
3.00 WALK TO D-2
.50 OIL JACK, CHECK OPER. OF WELL
3.90 WALK TO D-1
.90 OIL JACK, CHECK OPER. OF WELL
3.10 WALK TO D-3
1.00 OIL JACK, CHECK OPER. OF WELL
2.80 WALK TO D-5
.80 OIL JACK CHECK OPER. OF WELL
2.30 WALK TO D-10
2.80 CHECK OPERATION OF WELL AND UNIT
3.20 WALK TO D-5
.90 OIL JACK, CHECK OPER. OF WELL
2.00 WALK TO D-9
1.00 OIL JACK, CHECK OPER. OF WELL
2.50 WALK TO D-8
1.10 OIL JACK, CHECK OPER. OF WELL
3.90 WALK TO TANK BATTERY
3.70 CHECK TANK BATTERY OPER.
3.20 WALK TO POWER D-2
1.50 GAGE ONE TANK
3.30 WALK TO POWER D-2
7.10 COMPLETE GAGE REPORTS
11.00 CUT WEEDS AROUND POWER
3.90 WALK TO TANK BATTERY
4.30 CHECK OPERATION OF TANK BATTERY
5.80 SERVICE SALT WATER PUMPING UNIT
8
13.50 WALK TO POWER AND RETURN TO TANK BATTERY
1.00 WALK TO D 5-2
7.40 SERVICE PUMPING UNIT
11.10 EXPLAIN LEASE OPERATIONS
WALKING
IRREGULAR WORK
ROUTINE OR REGULAR WORK

Fig. 5—Pumping operations, activity chart.

ing. The maximum physical effort required was to lift the frost box and place it over the well head and meter, which operation could easily be accomplished by two men, thus determining the optimum size crew.

Use of a two-man crew could result in a saving in man-hours of 37.5 per cent. This is shown graphically in Fig. 1, which was constructed from notes taken while observing this four-man crew.

Even with good organization and planning, labor can be wasted due to man-hours consumed in traveling when the crew size is larger than necessary. A well-organized three-man maintenance crew was observed in which the pusher had the work planned; the truck was equipped so that no extra trips were made to pick up additional tools, supplies or repair parts; and all the jobs were located within an area of approximately 3 miles square. Of the total man-hours available, 30 per cent were spent in traveling between work locations, and 10 per cent were not utilized because of limitations of work space. A saving of 20 per cent of the total man-hours could be realized with a two-man crew. This amount of saving was possible solely by a reduction in the number of man-hours consumed in traveling, without taking into consideration any possible improvement in the manner of performing the work.

The entire day's work of this three-man crew is shown graphically in Fig. 2. This chart reveals that the three men were occupied simultaneously only 38.3 per cent of the time, and for 30.2 per cent, only one man was working.

Travel time.—In many cases crew travel time has been reduced over 50 per cent. This reduction was the result of two improvements.

First, the pusher was furnished with sufficient information concern-

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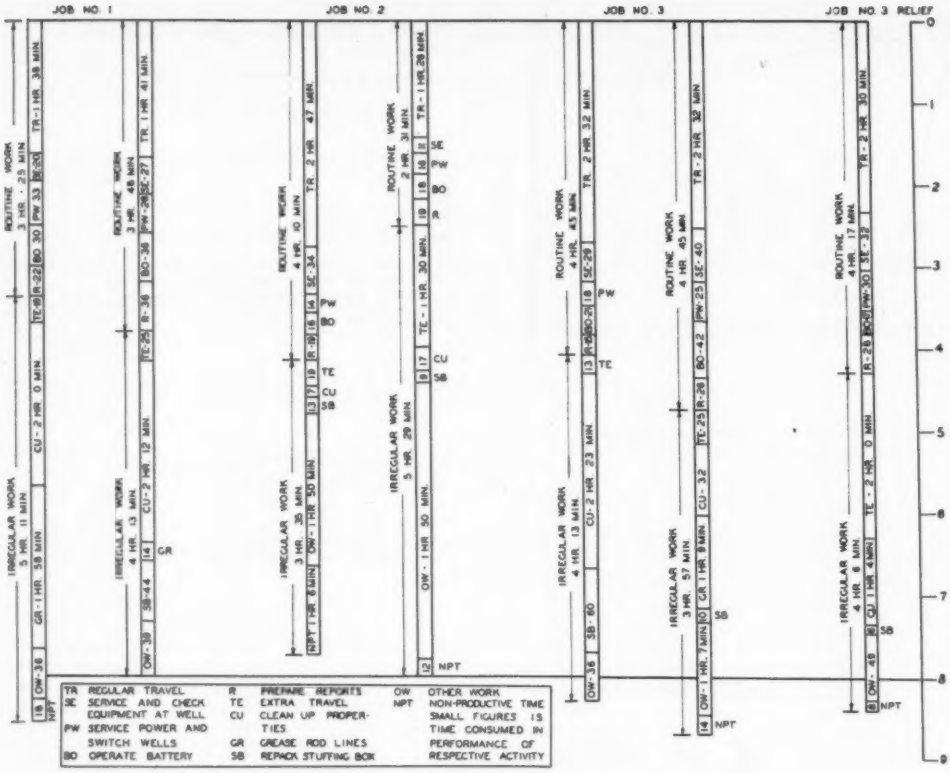
JOB NO. 1
JOB NO. 2
JOB NO. 3
JOB NO. 3 RELIEF
TR REGULAR TRAVEL
SE SERVICE AND CHECK EQUIPMENT AT WELL
PW SERVICE POWER AND SWITCH WELLS
BO OPERATE BATTERY
R PREPARE REPORTS
TE EXTRA TRAVEL
CU CLEAN UP PROPERTIES
GR GREASE ROD LINES
SB REPACK STUFFING BOX
OW OTHER WORK
NPT NON-PRODUCTIVE TIME
SMALL FIGURES IS TIME CONSUMED IN PERFORMANCE OF RESPECTIVE ACTIVITY

Fig. 6—Method-improvement study, pumper chart.

ing the jobs to predict the necessary tools and repair parts which would be required in a full day's work.

Second, the system of reporting and assigning priority to jobs was revised so that when a day's work was scheduled, it would not be interrupted.

Fig. 3 shows how excessive travel was reduced 64 per cent by the foregoing improvements.

Planning and instruction.—Improper planning due to insufficient knowledge of the job to be performed can result in the waste of a large per cent of the efforts of a crew. A two-man crew was observed while repairing an engine-base adapter. In this instance, 51.7 per cent of the job time was lost due to poor planning, lack of information, and unavailability of proper tools for the type of work encountered. Fig. 4 is an activity chart of this job. It shows which elements of work could have been eliminated by proper planning and instruction.

Substitution of tools for manual effort. — The desirability of substituting tools for manual effort has long been recognized. However, the problem involved in oil-field maintenance work is to have these tools available at the location where the work is to be performed. The nature of surface maintenance requires that the workman and all necessary tools and parts be transported to the work location.

In studying this problem in one district, the first step was to make an analysis of the jobs performed over a 2-year period. Approximately 72 per cent of the jobs were of such a nature that they did not require the combined physical effort of more than two men simultaneously, and, if some mechanical assistance could be provided, the remaining 28 per cent of the jobs could be performed by a two-man crew.

The second step was to determine what tools, repair parts, and facilities should be made available. This information was obtained by observing various crews at work over a 3-month period.

(Continued on page 152)

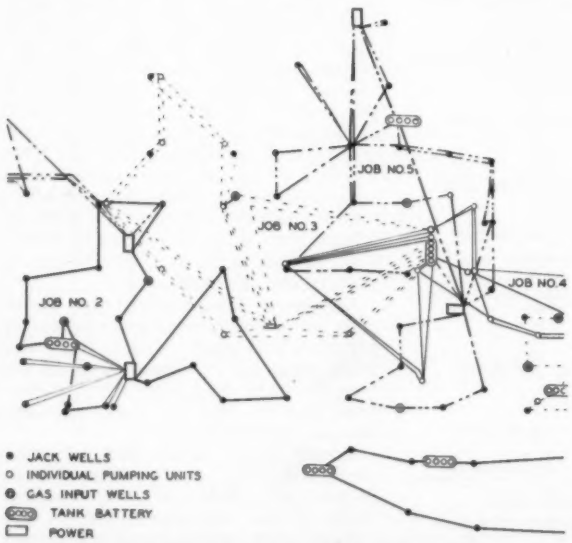

Fig. 7—Pumper's travel paths prior to job design.

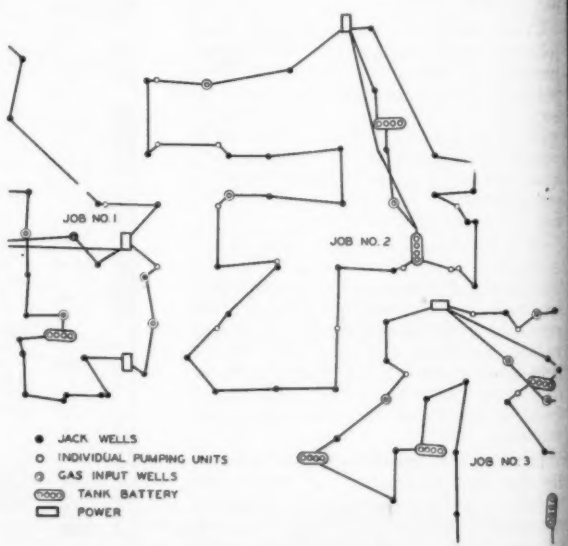

Fig. 8—Pumper's travel paths after job design.

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BENOIST WATER FLOOD

Patoka, Illinois, Pool

by H. S. Barger*

This article presents the history of the Benoist sand development, Patoka pool (Illinois) from the discovery date to present time. The studies that led to the installation of a pilot water flood in 1943 are outlined. Complete reservoir characteristics, including oil and water saturations at the beginning of water flooding, are given. The water-flood development program, recoveries, development, and operating costs, are included. Paper presented at A.P.I. spring meeting, division of production, Cleveland, April 26-28.

PATOKA field was discovered in February 1937 by the completion of Adams Oil & Gas Co. and Felmont Corp. 1 Meryman located in 21-4n-1e, Marion County, Illinois. The field's discovery touched off the second oil boom in Illinois. About 100 acres of the field extended into the city limits of Patoka, resulting in prolific drilling of town-lot wells.

The discovery well was completed in the Bethel sandstone, locally known as the Benoist, at a total depth of 1,418 ft. This well, which is one of the few wells that actually flowed, initially produced 100 bbl. of oil of 39° A.P.I. gravity. Within less than a month the well was put on pump and it pumped 135 bbl. oil per day after a 10-qt. shot.

The field was drilled on an irregular spacing pattern and a total of 132 producers were completed on approximately 700 productive acres. The wells initialed from 40 to 150 bbl. of oil per day and a maximum field production of approximately 2,400 bbl. per day was reached in January 1938. The production decline was very rapid but was retarded some by the completion of additional wells in 1940 and 1941.

The wells were drilled with rotary and, on most of them, the sand was cored with rotary. Casing was set on top the sand and cemented with 200-300 sacks of cement. All of the early wells were completed with 5½-in. casing but some of the later wells were completed with 4½-in. casing. After cementing casing, cable tools were used to drill plug, shoot, clean out, and put on production.

Individual pumping units, powered with gas engines, were installed on most of the wells. Pulloff jacks, operated by second-well attachments from the individual units, were installed on the remaining wells. In 1940, most of the field was electrified and power was furnished by a generating plant located near the center of the field. Natural gas was used for fuel for the generating plant which was gathered by a small rotary vacuum pump and vacuum system. The vacuum was automatically controlled and only enough was pulled to furnish sufficient gas for fuel.

Varying amounts of salt water were produced from the wells located on the south and northwest edges of the field. The salt water was disposed of through open pits and a disposal well into an upper sand.

Most of the wells in the town-lot area were edge wells with a thin productive sand section and the majority of them were abandoned within 2 years after completion.

*Sohio Petroleum Co., Oklahoma City.

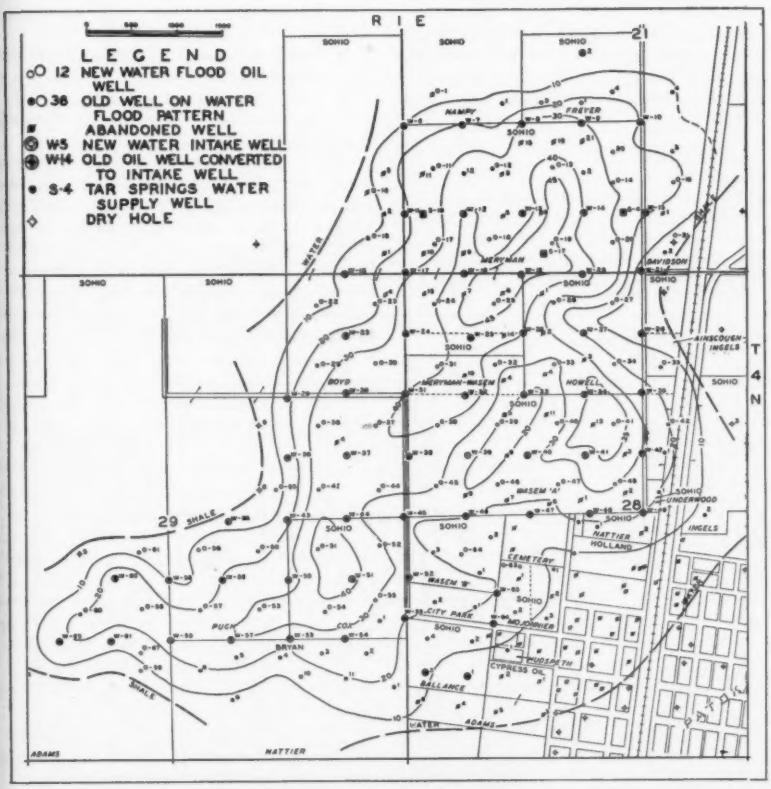

Fig. 1—Isopachus map of Benoist sand.

Geology

Patoka field is an anticlinal structure with a northeast-southwest trend. The Benoist is the main producing sand and is found near the base of the Chester series of Upper Mississippian age at an average depth of 1,410 ft. The producing formation is a lenticular sandstone of medium to fine subangular sand grains. It is a relatively clean sand except near the "shaled out" areas that occur in the northeast and southwest part of the field. There are several instances where shale and/or lime streaks occur within the sand section. The sand body extends into water on the south and on the northwest.

The Benoist had 50 ft. of closure that was oil productive.

Early Field Performance

The pressure - production history, gas-oil-ratio history, and water-production history all indicated very early that solution gas was the prin-

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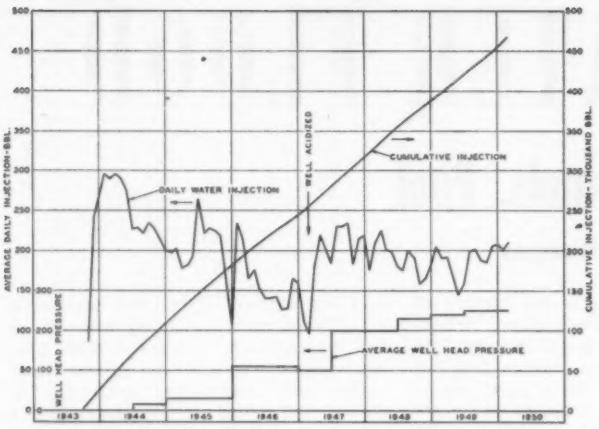

Fig. 2—Water-injection performance for individual well W-18 Meryman.

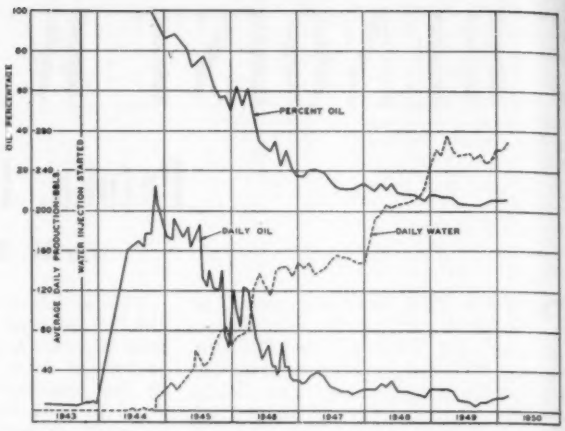

Fig. 3—Production performance for oil well O-18 Meryman.

cipal recovery mechanism. Within a year, the bottom-hole pressure dropped from 550 to approximately 200 psi. with less than 400,000 bbl. of oil produced. Original gas-oil ratio was estimated to be less than 50 cu. ft. per barrel of stock-tank oil and its increase was very gradual. Little or no water was produced except from the edge wells and the amount of water produced indicated that the edge water drive would be very ineffective.

A complete analysis of the reservoir data and field performance indicated that the natural reservoir energy would recover only a small part of the oil in place. It was estimated that the natural recovery would approximate 15 per cent of the pore space or 225 bbl. per acre foot.

Water-Flood Study

Complete data were collected on the production of oil, gas, and water for each lease and for the total field. Bottom-hole-pressure surveys and gas-oil-ratio surveys were made at different intervals. Edge-water encroachment was followed very closely.

In 1940 and 1941, a number of evaluation wells were located and drilled throughout the field to determine the average reservoir fluid saturations. All of the early wells had been cored with rotary and the cores analyzed but the saturation values obtained were not considered representative of the reservoir conditions. There were indications that the rotary cores were being badly flushed by the rotary-drilling mud and that the rotary core analysis only gave representative permeability, porosity, and effective thickness of the sand.

The evaluation wells were drilled by rotary but were cored with a cable-tool core barrel. Both oil and water were used as a coring fluid.

Reservoir Characteristics

The average reservoir characteristics as determined in 1942 by all the core data from both the original cores and the evaluation cores are listed as follows:

Porosity, per cent	19
Permeability, md.	110
Residual-oil saturation, per cent	53
Connate-water saturation, per cent	20
Water-flood residual-oil saturation, per cent	22
Oil-water transition zone, ft.	—945 to —949
Sand thickness, ft.	27

Oil Characteristics

Two bottom-hole samples taken from new wells drilled in different parts of the field in March 1942 showed the oil to have a viscosity of 5.35 cp. at a bottom-hole pressure of 30 psi. and 4.5 cp. at a bottom-hole pressure of 500 psi. The bottom-hole temperature was 80° F. and the formation volume factor was estimated to be 1.05.

Water-Flood Pattern

A number of water-flood patterns were laid out for the development of the field. Some of the problems confronting the operator were:

1. Large number of small leases involved.
2. Irregular spacing pattern of the producing wells.
3. Variable sand thickness.
4. Productive limits had not been completely defined.

After a number of proposed plans were completely analyzed, it was decided that a 10-acre 5-spot pattern was the most desirable from a recovery, economic, and practical standpoint. This pattern best fitted the reservoir sand conditions and the predicted injection performance indicated that sufficient water could be in-

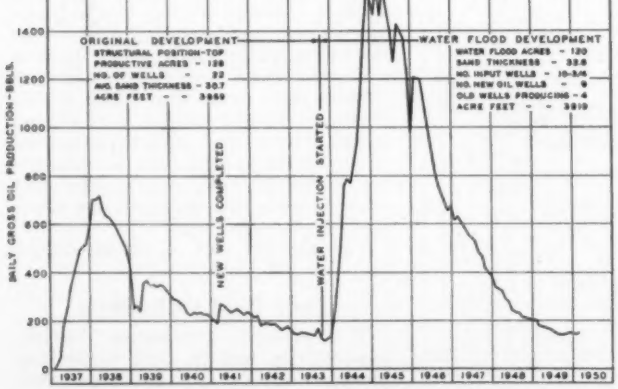

Fig. 4—Natural and water-flood performance for Meryman lease.

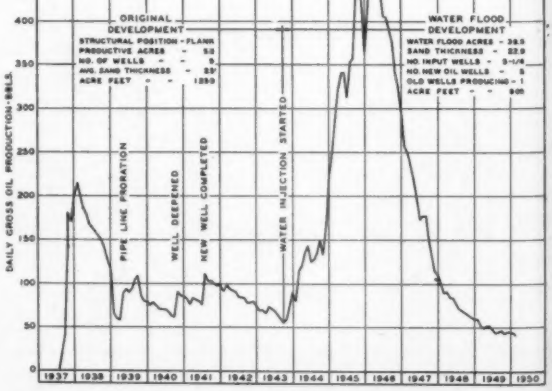

Fig. 5—Natural and water-flood performance for Boyd lease.

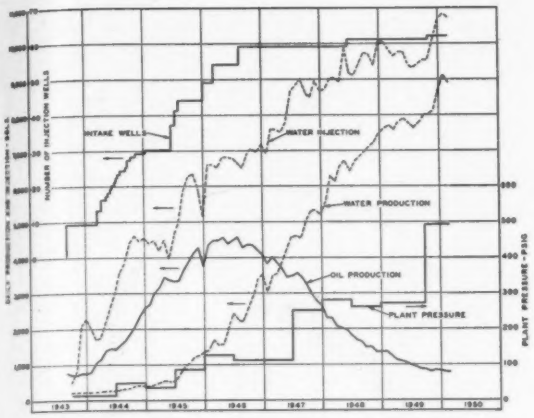

Fig. 6—Flood performance rate data, total field.

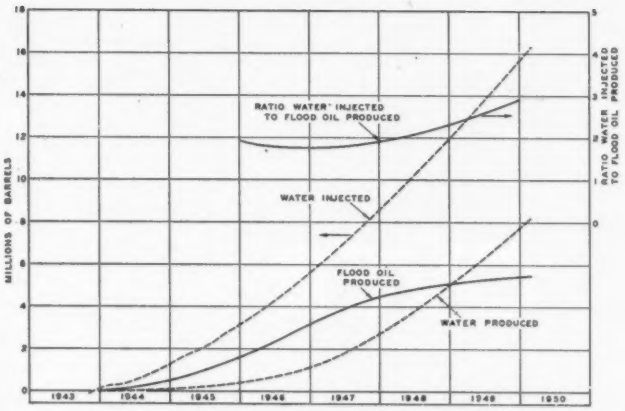
RATIO WATER INJECTED TO FLOOD OIL PRODUCED
WATER INJECTED
FLOOD OIL PRODUCED
WATER PRODUCED
MILLIONS OF BARRELS
RATIO WATER INJECTED TO FLOOD OIL PRODUCED

Fig. 7—Cumulative performance, total field.

jected to obtain maximum recovery within a reasonable time. The pattern also best fitted the property lines which permitted a minimum of unitization of the royalty interests.

In the north part of the field it was necessary to lengthen the pattern to 15-acre 5-spot and in the south part it was necessary to use irregular spacing to fit property lines. Approximately 40 of the original wells were off pattern and were subsequently abandoned.

Fig. 1 is an isopach map of the permeable sand above the oil-water contact. The isopach map shows the area of shaling out as well as the areas of edge water. The sand thickness under flood varies from a maximum of 47 ft. to a minimum of less than 5 ft.

An isoperm map was constructed to show the average permeability of the sand above the oil-water contact. The permeability ranges from zero to a maximum of approximately 600 md. There are low permeable areas in the east, northwest, west, and southwest parts of the field.

Development Program

Drilling for the pilot flood was started in April 1943. The pilot-flood area was located in the northwest part of the field and consisted of two 10-acre 5-spots and two 15-acre 5-spots. A total of nine intake wells and four oil wells were completed and water was turned into the first intake wells on September 3, 1943.

In January 1944, just 3 months after water was turned into the pilot-flood area, the drilling for the development of the whole field was commenced. The flood area was expanded both eastward and southward by the drilling of three to four wells per month. The water-flood development was completed in August 1946 and a total of 59 intakes, 39 new oil wells, and 2 dry holes had been completed.

During 1948 and 1949 a few edge wells were added making the total water-flood development include 62 intake wells, 40 oil wells, and 2 dry holes.

Well-Completion Practices

All of the wells were drilled with rotary and most of them were cored with rotary. A few of the intake wells were cored with cable tools. On the wells cored with rotary, 4½-in. casing was used and on the wells cored with cable tools, 5½-in. casing was used.

The casing was cemented with 35 to 50 sacks of cement and cable tools were used to drill plug, shoot, and clean out. Each intake well was shot with liquid nitroglycerin with the shot size varying from ½ to 2½ qt. per foot. After cleaning out, each well was hooked up with a meter, strainer, and throttling valve and in most cases, water was injected directly down the casing. Some wells were equipped with tubing and packer set inside the casing.

Producing wells that were converted to intake wells were reshot and thoroughly cleaned out before injecting water.

The oil wells were completed in the same manner as the water-intake wells except 4½-in. casing was used throughout. They were equipped with 2-in. tubing, ⅝-in. rods, and 5-hp. pumping units driven by electric motors.

Water Supply and Treatment

The water supply is obtained from the Tar Springs sand which occurs at a depth of 1,000 ft. and has a sand section of approximately 100 ft. in Patoka field. The Tar Springs water is very salty, has approximately 100,000 p.p.m. total solids, and has a total iron content of 12-16 p.p.m. It has a specific gravity of 1.075, a pH range of 6.8 to 7.1.

Three off-pattern Benoist oil wells were plugged back and recompleted in the Tar Springs as supply wells. The main supply well was equipped with a centrifugal pump set at approximately 400 ft. This well has a capacity of 7,500 bbl. per day from a 400-ft. setting and a potential capacity of 15,000 bbl. if pumped down. The other two supply wells were equipped with conventional equipment and are used for standby service.

The supply water and the produced water are pumped over slat-tray aerators and then collected in settling and storage pits. From storage pits, water

(Continued on page 154)

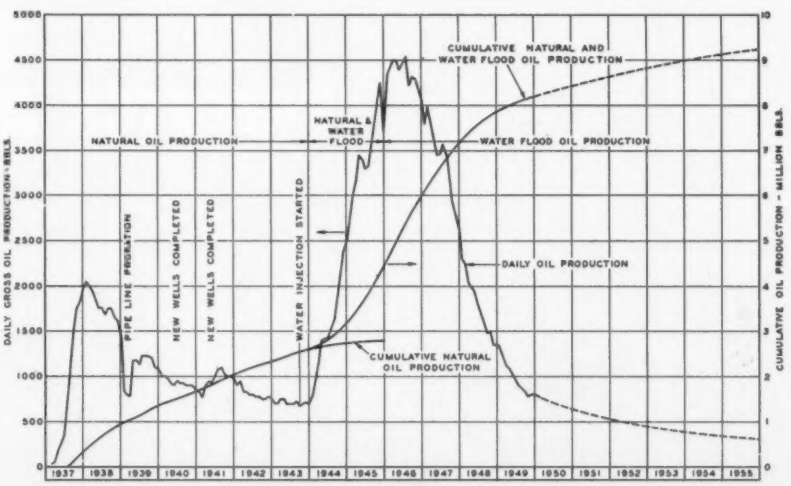
CUMULATIVE NATURAL AND WATER FLOOD OIL PRODUCTION
NATURAL OIL PRODUCTION
NATURAL & WATER FLOOD
WATER FLOOD OIL PRODUCTION
DAILY OIL PRODUCTION
CUMULATIVE NATURAL OIL PRODUCTION
PIPE LINE PEGRATION
NEW WELLS COMPLETED
NEW WELLS COMPLETED
WATER INJECTION STARTED
DAILY GROSS OIL PRODUCTION - BBLS.
CUMULATIVE OIL PRODUCTION - MILLION BBLS.

Fig. 8—Natural and water-flood performance, total field.

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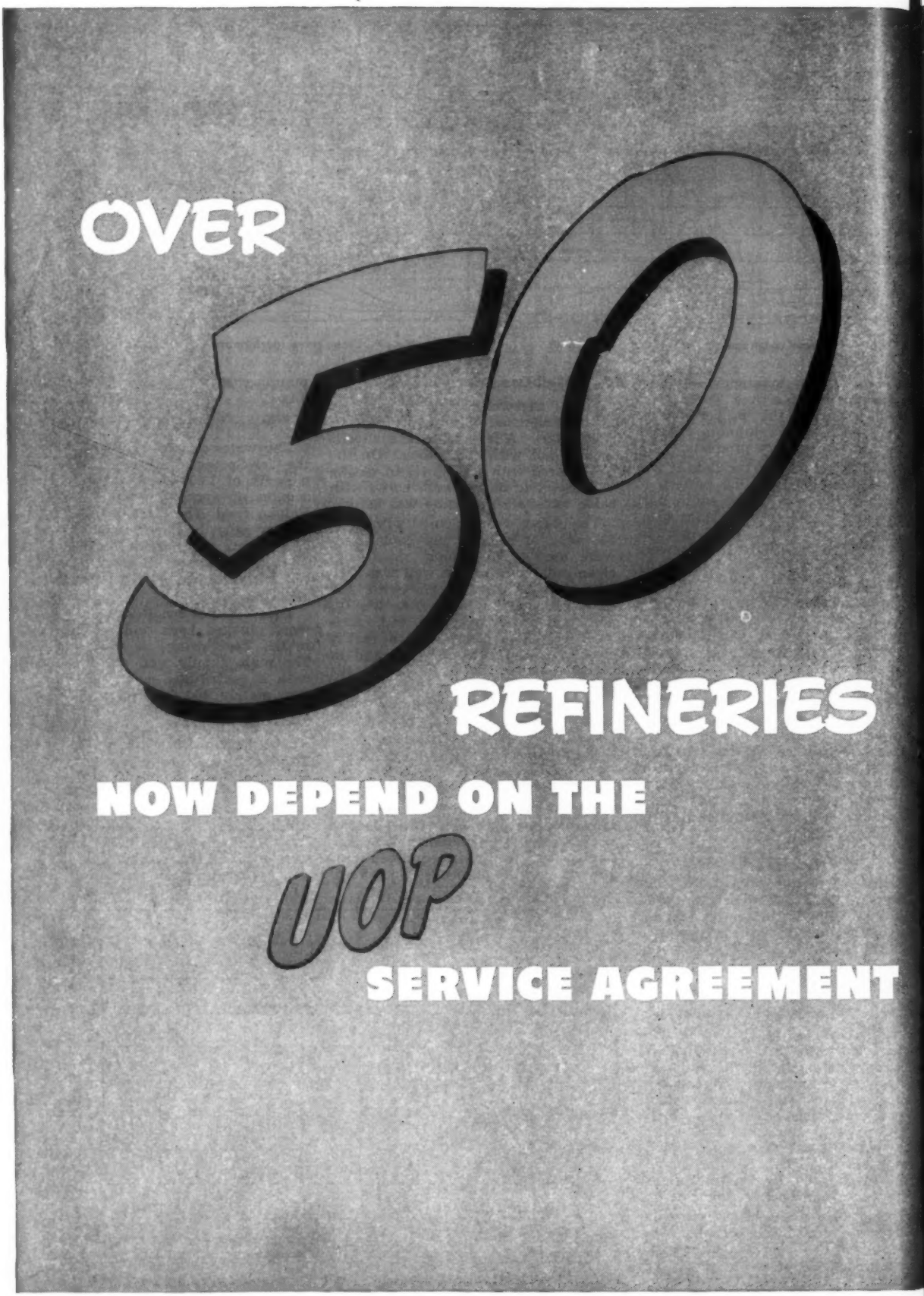
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NEW EMPHASIS ON AN INDUSTRY BY-WORD

Universal Service Protects Your Refinery

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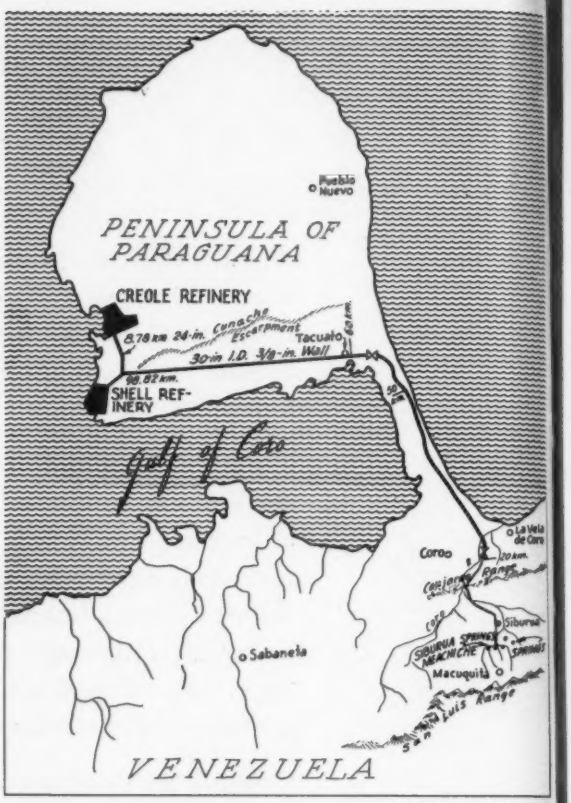
Creole-Shell Siburua Water Line Is Coated Inside by New Method

by Robert L. Buck

This article deals with practices developed for the first successful operations for internal coating of pipe, as long as three-joint sections. This procedure promises to have wide application for lines for water and sour crude oil. The equipment for the job was not developed by a trial-and-error procedure but was entirely designed and fabricated in advance particularly for the Siburua water-line project.



Route of the unique big inch (30 and 34-in.) internally coated water line which serves the new Western Venezuela refineries of Creole and Shell. This is believed to be the largest pipe-line system for water ever installed in the petroleum industry.

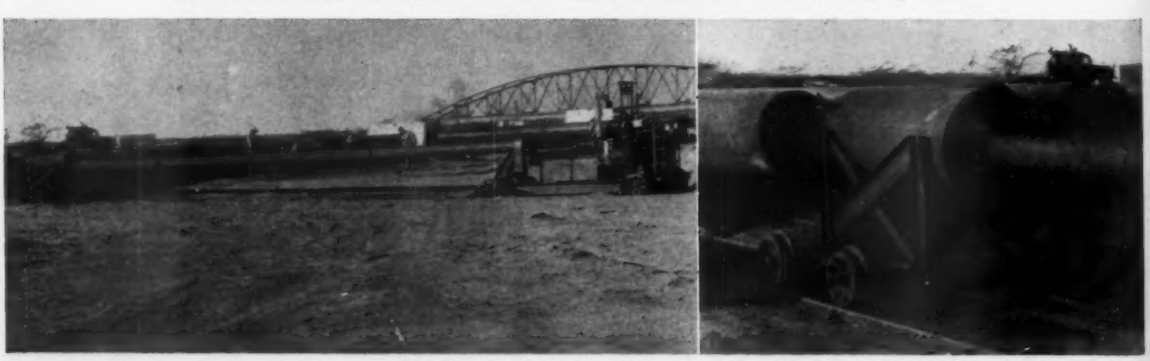
AT the present time Williams Brothers Co. has under construction a fresh-water pipe line that will originate at the Siburua Springs near Coro Falcon, Venezuela, and furnish fresh water to the refineries of Shell Oil Co., Creole Petroleum Corp., and the villages of Las Piedras and Punto Fijo. This 130.68-km. line is 34 in. in diameter at its origin near the springs; it is reduced to 30 in. in diameter for the major part of the line. At the point of trifercation the line furnishing water to Shell will be 20 in. in diameter, the line furnishing water to Creole will be 24 in., and the size of the one furnishing water to the villages has not yet been determined. The project has pipe of various diameters as follows: 18 km., 34-in.; 98.82 km., 30-in.; 8.78 km., 24-in.; and 5.08 km., 20-in. This system is being constructed through the joint association between the two oil companies and the Venezuelan Government.

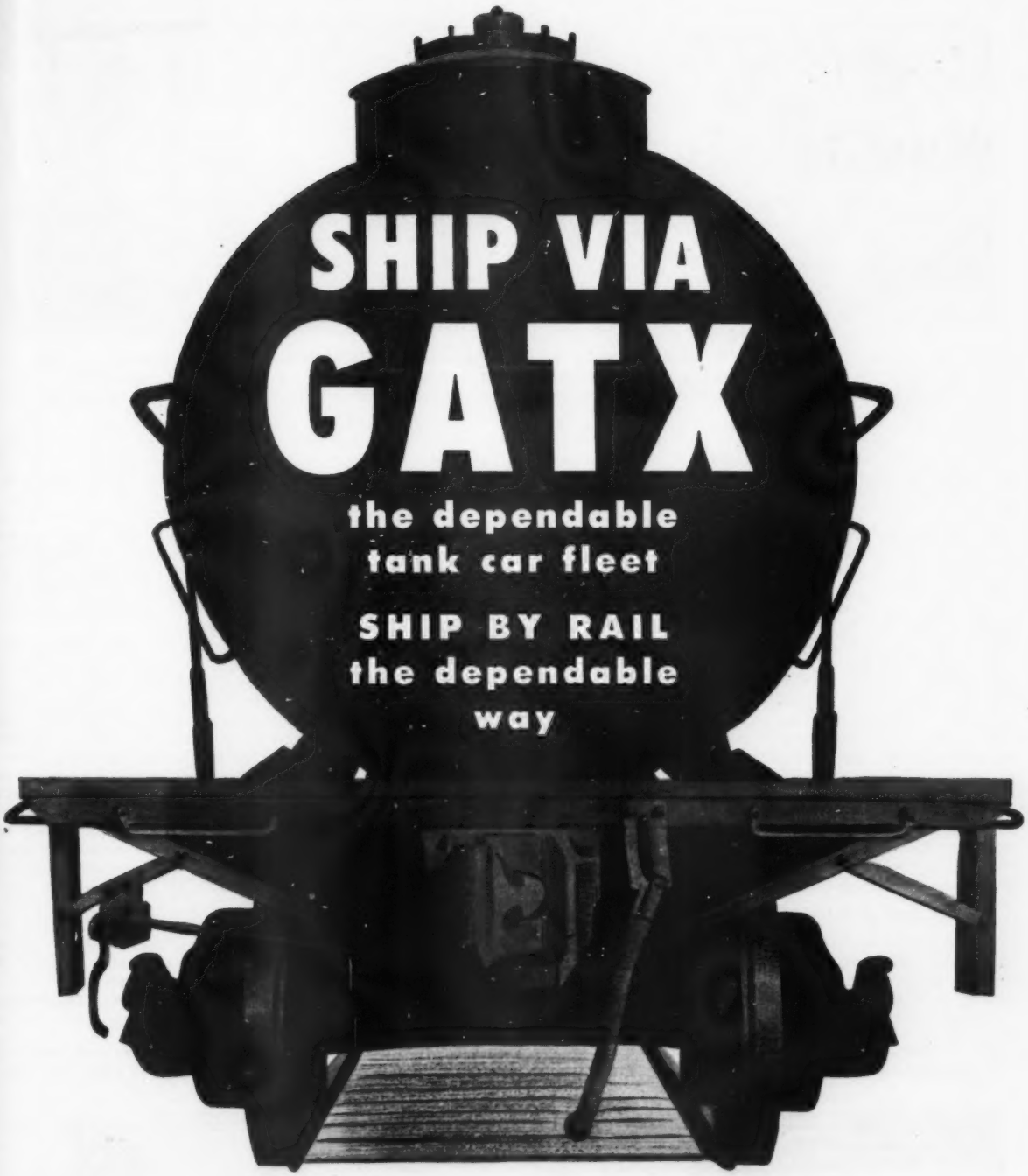
The Siburua Springs are of such capacity that it is felt they could furnish sufficient water for the system during all seasons, but as a manner of precaution and assurance of adequate supply, nine wells are also being drilled, three of which will belong to each of the oil companies and three to the Venezuelan Government. These will be drilled in the near vicinity of the springs and laterals laid into a common manifold in that area.

The line itself extends from the

Robert L. Buck came to his present position as construction executive with Williams Brothers Co. after oil-production and pipe-line construction experience. From 1936 to 1941 he was with Truman & Smith Construction Co., El Dorado, Kans., 1941 with O. E. Dempsey Construction Co., 1942 with J. C. Truman; 1943 with Ford, Bacon & Davis Construction Co. He has been with the Williams Brothers organization since 1944. He grew up and went to school at El Dorado, Kans.

Left: Ram-rod type of internal cleaning machine operated by engine-driven car running on a track. Automatic welding equipment is suspended from bridge-like trusses in distance. Right: Internal cleaning head supported in car-mounted nest from which it will be pushed into the pipe. Holding in the nest is required because the head is in spring tension.





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Left: Close-up of engine-driven car for internal cleaning machine. Sprocket wheel of car engages in chain between the tracks for moving. Right: Special internal hydraulically operated line-up fixture developed for the job used in connection with running stringer beads by hand as the first step in double and triple jointing, before sections are rolled to automatic welding operations.

mainland across the Isthmus of Medanos to the Paraguana Peninsula on which the refineries are located. The line is laid on top of the ground throughout its course except where supported by fabricated pipe bents in such places as are apt to wash badly. It is laid on precast concrete blocks across the isthmus where it is located in the blow sand dunes and unprotected from the salt spray of the ocean. The difference in elevation at the origin and the terminus of the line is some 800 ft., therefore, it will operate entirely by gravity. No corrosion protection is placed on the outside of the pipe with the exception of such places where it is covered to make ramps for road crossings and for the portion extending across the isthmus that is unprotected from ocean spray. In these locations it is covered with 50B cold pipe-line enamel. Throughout the rest of the line it is merely whitewashed.

Development of Internal Coating

Probably the most unusual feature in this system, which is something that has never been done successfully before, is coating the inside of the multiple-jointed steel pipe with hot pipe-line enamel. Due to the fact that this line is welded and that it was desirous to haul the pipe in the longest sections possible, it was thought that the inside coating would present a serious problem. However, engineers of Williams Brothers Co. were able to originate and devise a plant and procedure that enables them to coat the inside of the steel pipe to the required specifications through yard operation, and also coat the tie-in welds in the field in a manner that gives absolute assurance that the system is completely coated to the satisfaction of the owners.

The pipe furnished for this project is a combination of different manufacturers, some from the United States and some from England. Construction is further complicated by the fact that the pipe is 30 and 34-in. i.d. which makes it an unusual size as far as conventional pipe-line equipment is concerned. Therefore it was necessary to obtain specialized equipment and determine the method of handling that would prove standard to the construction.

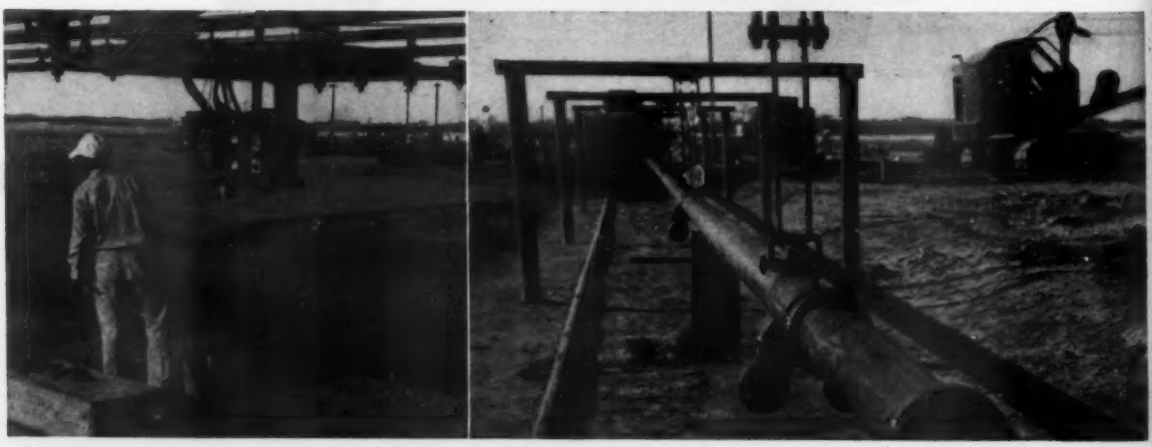
The 30-in. pipe that was furnished by Creole was received in approximately 40-ft. lengths, whereas the 30-in. furnished by Shell, which was English manufactured, was in only 26-ft. lengths. It therefore was necessary to construct the plant so that it would be possible to double joint the 40-ft. pipe, and triple joint the 26-ft. pipe, resulting in approximately 80-ft. lengths when ready for installation into the line.

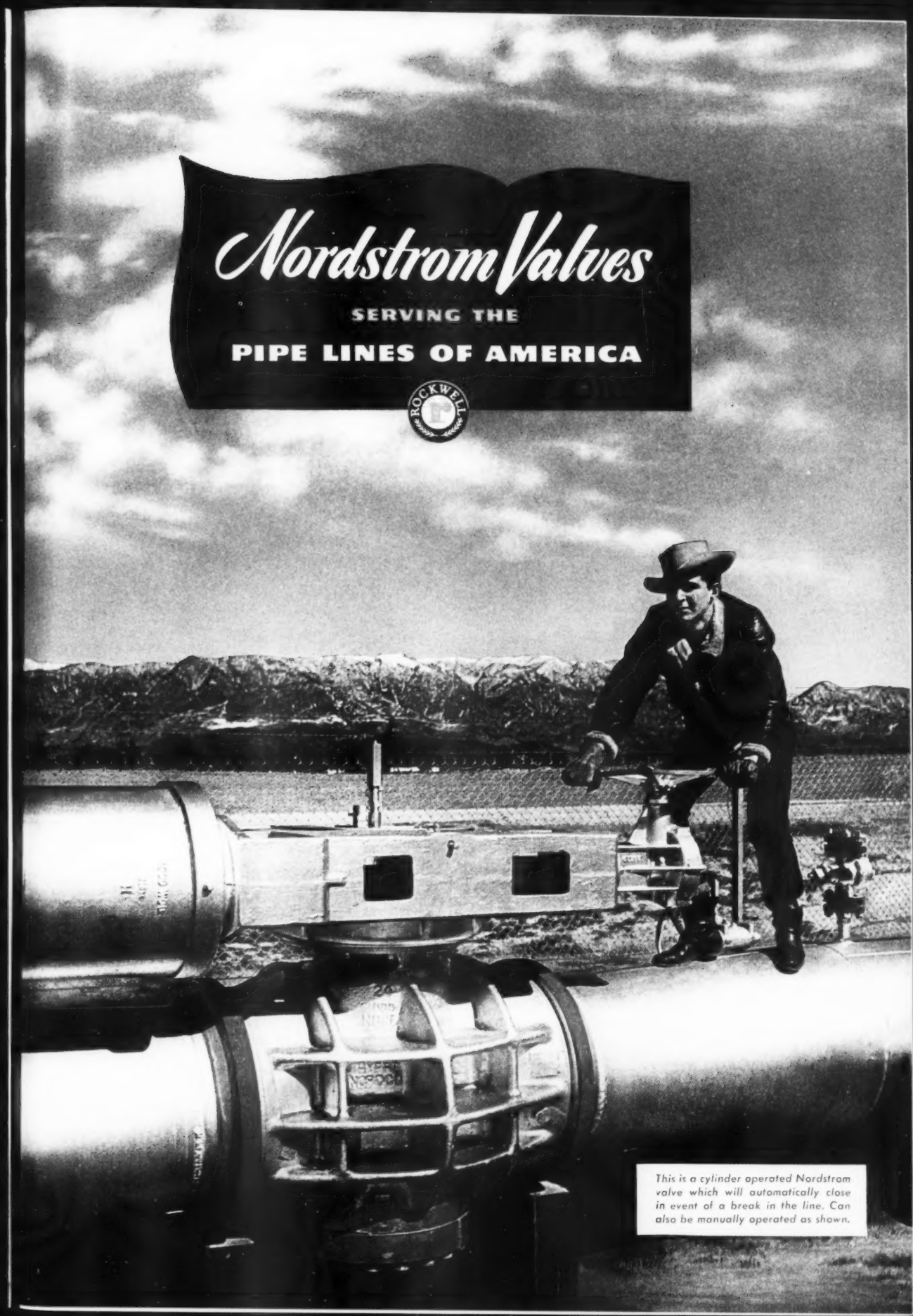
The pipe used in this project had been in outdoor storage on the Paraguana Peninsula for sometime and by being loaded and unloaded from ocean vessels, and moved to various locations for storage, the ends and bevels had received some damage. Also a thin protective tar coating was on the inside of the pipe to protect it from corrosion. All these things entered into the planning of the plant so that efficient production could be maintained to eliminate any delay in field construction.

Inside Cleaning Machine

The pipe is first hauled from its storage yard to the plant site and off loaded on pipe ramps that convey it to the operation of straightening

Left: Automatic welding equipment for submerged arc process, suspended from special bridge truss serving as overhead conveyor to facilitate spotting for welding either the 26-ft. English or the 40-ft. American joint lengths. Right: 80-ft. stationary boom for inside coating. Pipe is pushed and rotated over the boom.

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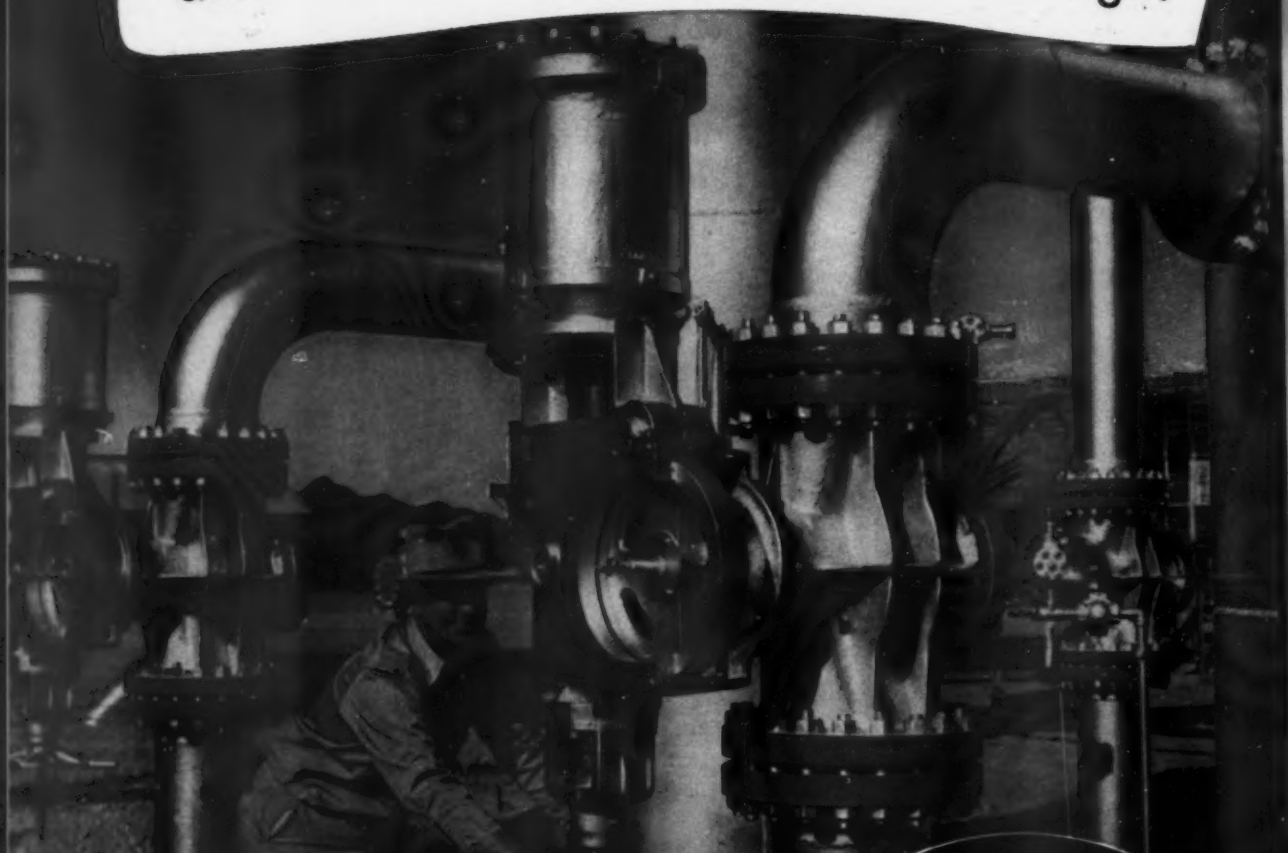

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the ends when possible or rebevelling those that are most severely damaged. From these operations it is conveyed to the inside cleaning machine that removes all dirt, rust, and the protective coating from the inside. This machine is of portable nature and is mounted on a long boom and operates similar to a ramrod for a rifle.

After the pipe is thoroughly cleaned inside, it then moves to the internal alignment fixtures which make the necessary alignment either for double or triple joints depending on length of the section. After these alignments have been effected, the stringer bead or first welding pass is installed manually and the long sections are then ready for final fabrication by the automatic electric welding equipment. This welding equipment is so installed and regulated that it is possible to make a weld at any point along the 80-ft. length of the section in approximately 7 minutes.

After the welding has been completed and inspected, the pipe is then conveyed to the equipment used for coating the inside with primer. This is a simple operation which consists only of the mounting of a large-capacity paint spray gun on a boom sufficient to transverse the entire length of the section. After priming, each end of the pipe is whitewashed on the inside back a distance of 6 in. so that when the hot enamel is applied there will be no bond in the end areas and therefore will not affect the field welding at the time of installation. The pipe is now ready for its inside coating of hot enamel.

The primer sections are now conveyed to mechanical power driven rollers mounted on carts similar to small railroad cars. These carts are powered to rotate pipe at the required speed, and also to move it horizontally simultaneously. The inside enamel is heated in mechanically agitated tar kettles and pumped from the kettle through an 80-ft. steam-jacketed boom into the paint head itself. Control of the flow of paint through this boom is automatic.

The long section of pipe is then moved over the entire length of the paint boom, the determined rotation is commenced, and the pipe is withdrawn from the boom at such a speed that leaves the coating of enamel on the inside of the pipe to the specified thickness. After the pipe is completely painted in the inside, it continues to rotate for sometime while compressed air is blown through the section disbursing all the smoke and aiding in the cooling of the enamel. By hydraulic lifts the pipe is then returned to the conveyor and moves onward for flaw detection of the coating and whitewash of the outside. It is then ready to be reloaded and hauled to the field.

The pipe is carried to the field by trucks and trailers, capable of moving five 80-ft. sections, or approximately 40,000 lb. Upon arrival in the field the 80-ft. sections are immediately welded into 240-ft. sections then the inside coating of the tie-in welds is applied. The 240-ft. sections are then welded into the main line and the final tie-in weld is coated.

Small electric-driven, rubber-tired, self-propelling carts, sufficient to carry a man into the section, were prepared in order to coat the tie-in welds. Mounted on the cart is an electrically heated 5-gal. kettle which enables the carrying of enamel at the proper temperature to the joints to be coated. This procedure of welding and coating is continued until approximately 2 km. of line have been tied in, a manhole is then set, and the final tie-in weld is coated by access through this manhole.

By this construction procedure the crews have been able to lay approximately 1½ km. in a 10-hour working day, and at the present time have 70 km. of the main line completed.

Petroleum Radio Meeting

HOUSTON.—The 1950 annual meeting of Region IV, Petroleum Radio Frequency Coordinating Association, will be held at the Rice Hotel here June 15-16. Region IV is the Southwest United States area, covering Texas, Louisiana, Arkansas, and Mississippi, A. L. Stegner, secretary of the association, said.

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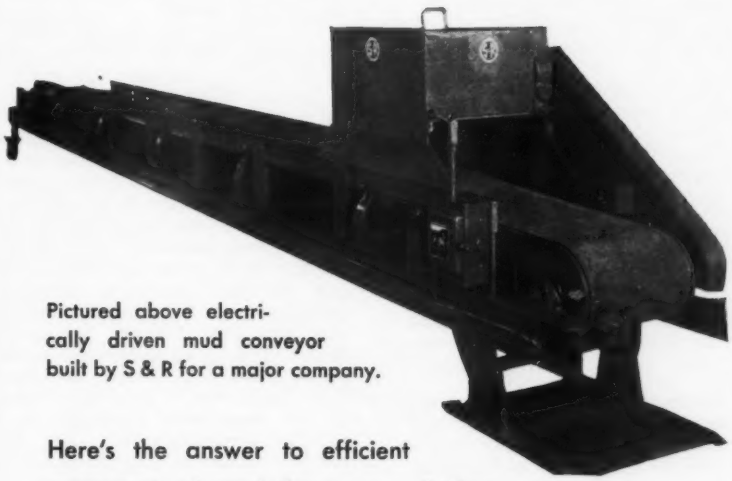

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SIGNIFICANCE OF PUMPING RATES IN SQUEEZE CEMENTING

by George C. Howard* and C. R. Fast*

SQUEEZE-CEMENTING problems are so intimately related to the earth's overburden pressure that solutions to them are very difficult, if not impossible, without an understanding of the nature and magnitude of the burden pressures encountered at the depths of producing wells. It was thus felt that the first approach to research on squeeze cementing should be made through a study of these pressures.

Since there has been rather loose usage of a number of the terms related to overburden pressure by different writers, the terms to be subsequently used are defined here.

Theoretical overburden pressure is the calculated pressure at any given depth exerted by the theoretical weight of overlying formations as calculated from the average rock density.

Fluid displacement pressure is that pressure at which fluid can be injected into a formation after it has been broken down. It may be more or less than the theoretical overburden pressure.

Formation breakdown pressure is that pressure at which a formation parts or breaks and is usually thought of as fluid displacement pressure plus rock strength.

Breakdown agent is that fluid with which the formation is fractured.

*Stanolind Oil & Gas Co., Tulsa, Okla.
Presented at spring meeting A.P.I., Division of Production, Casper, Wyo., April 1950.

The first step in the study of the earth's overburden pressures involved a review of pertinent technical literature. The general opinion expressed was that the overburden pressure gradient of the earth's formations is roughly 1.0 psi. per foot of depth, and that application of sufficient pressure to stratified formations will cause them to part at or parallel to the bedding planes.

The second step in the study of overburden pressures involved a study of available well data in an effort to obtain some definite information as to the actual values experienced in the field for the above-mentioned terms. Data from 115 cement-squeeze jobs in the Gulf Coast area and 46 cement-squeeze jobs and acid jobs in the West Texas-New Mexico area were closely analyzed.

Analysis of these data showed that the average formation breakdown pressure prior to squeeze cementing was less than 1.0 psi. per foot of depth. The fluid-displacement pressures, however, varied so greatly with depth due to structural stresses in the earth and elasticity of the earth's formations, that they could not be defined in general terms. For example, they were found to vary from 0.75 to 1.11 psi. per foot at 2,000 ft., and from 0.57 to 0.85 psi. per foot at 8,000 ft. Neither formation breakdown nor fluid displacement pressures varied linearly with depth.

In general, it was found that the effective overburden pressure at a given depth, as determined from field data, was less than the theoretical pressure or the pressure calculated from the rock densities. This discrepancy can probably be best attributed to two factors.

During the injection of fluid into a fracture in a formation, the entire overburden probably is not actually lifted by the injected fluid. The forces exerted in injecting the fluid probably tend to deform the rock in the vicinity of the fracture by a combination of bending and compressing, such that the actual overburden weight resisting deformation is measured from the formation fracture to some neutral plane well above it.

The second factor tending to reduce the fluid injection pressure, as compared to the theoretical overburden pressure, is the structural position of the formations above the fracture. In some cases it was believed that the structure of the formations above the fractured section of the well bore may tend to support by beam or arch some of the weight of the overburden.

Some of the more pertinent data obtained from the review of available well files are plotted on Fig. 1, which presents the average formation breakdown pressures and average fluid injection pressures for the Gulf Coast, West Texas-New Mexico areas.

Fig. 2 presents a comparison be-

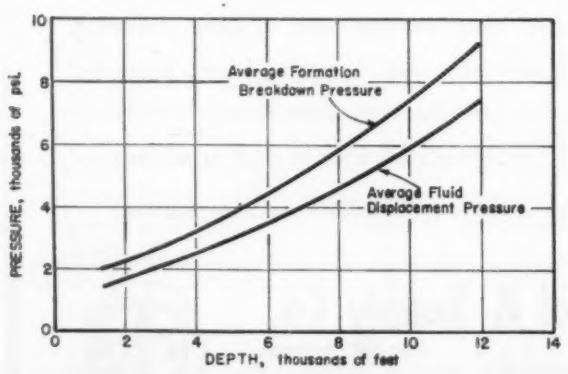


Fig. 1—(Left) Average field breakdown and displacement pressures.

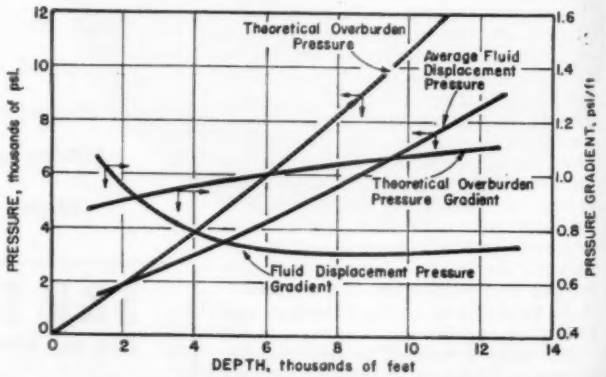
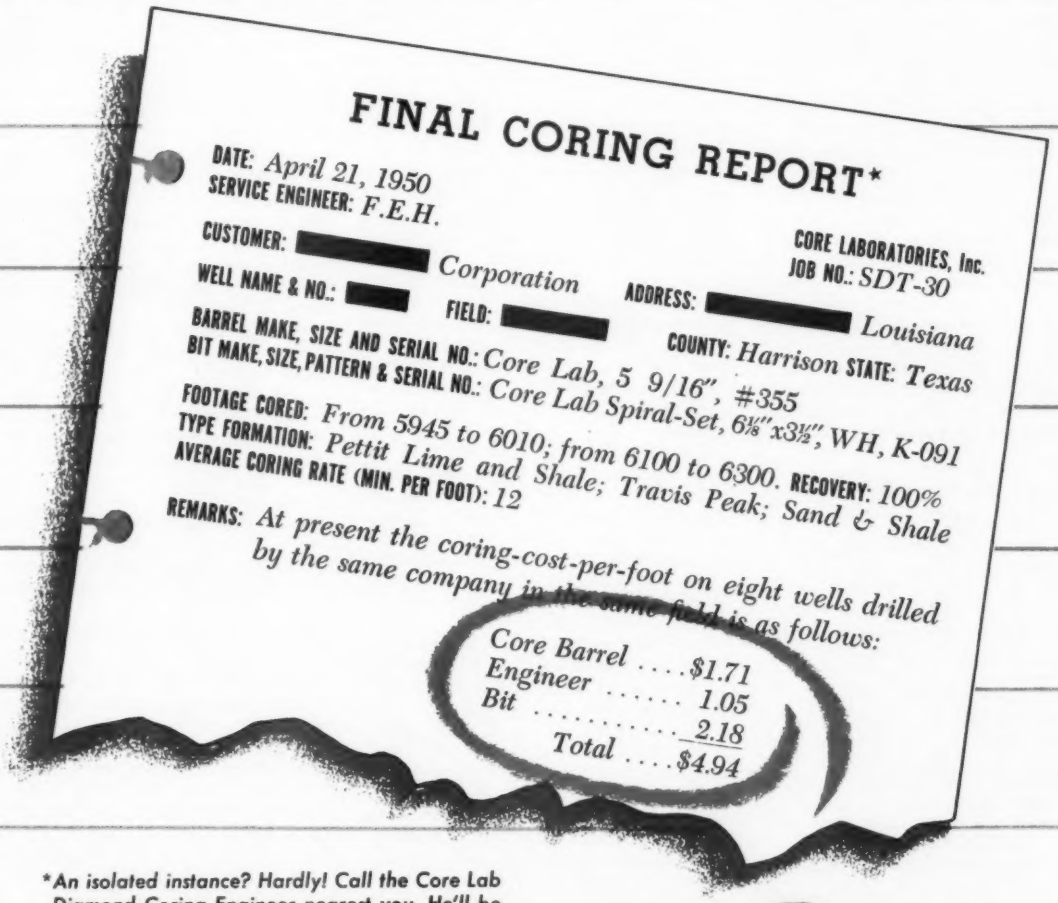


Fig. 2—(Right) Comparison of theoretical overburden and fluid displacement pressures.

At present the [redacted] Corporation's diamond coring-cost-per-foot on eight wells is as follows:



FINAL CORING REPORT*

DATE: April 21, 1950
SERVICE ENGINEER: F.E.H.

CUSTOMER: [redacted] Corporation
CORE LABORATORIES, Inc.
JOB NO.: SDT-30

WELL NAME & NO.: [redacted]
FIELD: [redacted]
ADDRESS: [redacted] Louisiana
COUNTY: Harrison STATE: Texas

BARREL MAKE, SIZE AND SERIAL NO.: Core Lab, 5 9/16", #355
BIT MAKE, SIZE, PATTERN & SERIAL NO.: Core Lab Spiral-Set, 6⅛"x3½", WH, K-091

FOOTAGE CORED: From 5945 to 6010; from 6100 to 6300. RECOVERY: 100%
TYPE FORMATION: Pettit Lime and Shale; Travis Peak; Sand & Shale
AVERAGE CORING RATE (MIN. PER FOOT): 12

REMARKS: At present the coring-cost-per-foot on eight wells drilled by the same company in the same field is as follows:

Core Barrel	$1.71
Engineer	1.05
Bit	2.18
Total	$4.94

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CORE LABORATORIES, INC. ● DALLAS, TEXAS

DALLAS HOUSTON CORPUS CHRISTI SHREVEPORT TYLER
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tween the theoretical overburden pressures (rock-density method) and the fluid-displacement pressures obtained from field data. Shown also is a comparison of the corresponding overburden pressure gradients. The reasonably close agreement between the theoretical overburden pressure and the average field data at the shallow depths probably explains why many observers have concluded that 1 psi. per foot of depth is applicable to deep-well squeeze-cementing operations.

While the information obtained in this theoretical investigation of pressures encountered in squeeze-cementing operations did not offer any definite proof of what actually takes place down a hole, it did show that the pressures encountered on squeeze-cementing jobs are sufficient to fracture and subsequently displace the fluid being squeezed out into the formation.

This preliminary investigation indicated a definite need for extensive laboratory and field testing to establish whether or not cement is forced out into formations during the squeeze-cementing operations. The answer to this question would permit steps to be taken to control the penetration of the cement slurry into the formation, which should increase the effectiveness of squeeze-cementing operations. It was in an effort to obtain answer to this last question that the next series of investigations was made.

Laboratory Shallow-Well Experiments

During the past several years an extensive research program on squeeze cementing has been conducted with the objective of improving squeeze-cementing operations. The initial portion of this program involved test work in wells at very shallow depths. A relatively hard sandstone was found a few feet below the surface in the test wells, making extensive testing of various cementing operations possible. These wells were drilled, squeezed using various techniques, and later excavated to observe the results.

Among the questions to be answered before improved squeeze-cementing procedures could be recommended were:

1. Where does cement go during a squeeze job?
2. Where does cement go during successive squeeze jobs?
3. Should mud or water be used to break down formations prior to squeeze cementing?
4. Can cement be spotted at any desired elevation in the formation?
5. Will the squeezed cement completely surround the well bore?
6. Can perforations in casing be readily plugged by squeezing cement?
7. How can the quantity of cement placed out in the formation be controlled?

The ability to answer these questions by laboratory shallow-well tests depended entirely upon the assumption that the results so obtained would at least reflect the behavior of cement slurries on squeeze jobs at depths encountered in the field. How these shallow-well tests compare with the actual behavior of cement in field practice is difficult to determine.

The first impression is that, owing to the great differences in pressure at 10 ft. and 10,000 ft., the behavior of cement slurries squeezed out at different levels should be entirely different. However, a comparison of the results of shallow-well tests with the results obtained in coring two deep wells, discussed later in this paper, suggests that certain parts of the shallow-well experiments reflect fairly accurately the actual behavior of cement slurries during field squeeze-cementing operations.

Where does cement go on a squeeze job?—This was the first point to be investigated in the shallow-well tests. There are three main schools of thought on this question.

One group holds that cement slurry squeezed against formations tends to compress soft sands and shales around the well bore thereby enlarging it. The pressure buildup at the end of the job is believed to be a result of maximum compaction of the formations.

The second group believes that cement slurry squeezed in a well tends to follow a vertical path behind the primary cement job displacing any mud and mud filter cake present, with the pressure buildup being a result of both filling the space behind the pipe and dehydrating the cement against the formation.

The third group holds that formations are fractured before injection of the cement and that the pressure buildup at the end of the job is a result of dehydration of the slurry in the fracture and about the well bore. In actual field practice probably all three schools of thought are partially valid with no one theory being entirely correct. However, shallow-well experiments, that will be described later, gave evidence of only limited vertical movement of the cement slurry behind the pipe with a predominance of the cement being forced into the previously fractured formation in sheets or pancakes about the well bore.

Several shallow wells were squeeze cemented in an attempt to clarify this point. The first well was drilled to a depth of 9½ ft. with 3-in. casing set at 7 ft. in solid sandstone. The formation was broken down with water at a maximum pressure of 850 psi. and 15 sacks of standard portland cement slurry were squeezed into the formation. A maximum squeeze pressure of 1,500 psi. was obtained. Before and after the squeeze-cementing operations, ground elevations were taken at four stations spaced at 90° 5 ft. from the test well.

Data strongly indicated that the cement slurry was squeezed out in a horizontal sheet or "pancake" parallel to the bedding planes and actually lifted the overburden. This proved to be the case when this well was excavated to observe the results. A cement pancake 1½ to 2 in. thick, with a lateral spread of 360° around the well bore, was found just below the casing seat. This cement spread laterally from the well bore more than 5 ft. (extent of the excavation) in all directions.

A total of 15 shallow wells were squeeze cemented during this series of laboratory tests, and in each case the cement spread horizontally from the well in relatively thin sheets approximately parallel to the bedding planes. If a zone of weakness such as a clay streak or bedding plane was encountered, the cement followed this zone of weakness.

In some instances vertical fractures, which were generally believed to be caused by weathering, were encountered a few feet from the well bore and the cement followed these fractures. In only a few instances was any cement forced vertically between the casing cement and the formation. In these test wells only a small portion of the total cement slurry was lost in this direction, with the major portion of the cement slurry being displaced horizontally into the formation. This lack of vertical movement of cement slurry is probably accountable to the fact that good primary cement jobs were obtained in all test wells. In no case was the formation noticeably compacted or squeezed back, nor was the cement slurry forced into the interstices of the sandstone.

Where does cement go during successive squeeze jobs?—After determining in these shallow-well tests that the majority of the squeezed cement slurry traveled in a horizontal direction from the well bore, the question arose as to where the cement goes when a well is squeezed and resqueezed at the same level. To investigate this problem a well was drilled to a total depth of 7 ft., 3-in. pipe set and cemented, and the well deepened approximately 1 ft. This well was squeeze cemented three times with different colored cement for purposes of identification.

Red slurry was used on the first job, after breaking down with water, and nearly a cubic foot of slurry was displaced at a pressure of 50 psi. before the pressure built up to approximately 500 psi. The following day the hole was cleaned out, the formation again broken down, and approximately 1½ cu. ft. of yellow colored cement slurry was squeezed out at 20 psi. before the pressure increased to 500 psi. The third squeeze job

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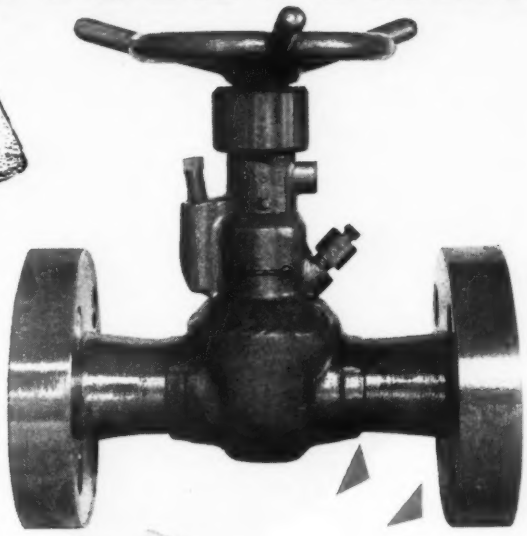

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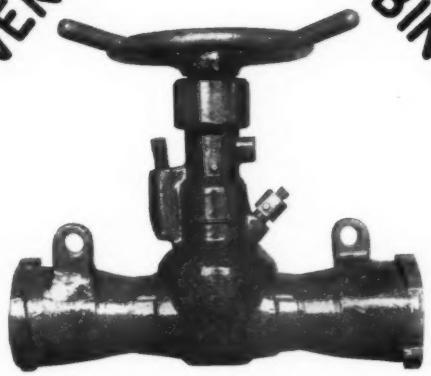

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was performed approximately 4 hours later after drilling out the cement plug and breaking down the formation a third time with water. Black cement slurry was squeezed into the well at 30 psi., and after 1½ cu. ft. of slurry had been placed, the pressure again increased to 500 psi. Subsequent excavation of this well showed that the cement slurry exhibited a general tendency to follow the squeezed cement of previous jobs.

Other shallow wells subsequently squeeze cemented two or more times in the same interval exhibited a general tendency for the cement slurry to follow the same zone of weakness as did the cement of the first job. While these shallow-well tests may not exactly represent what happens on a typical field squeeze-cementing job, it is believed that these results do indicate that the cement slurry will seek the path of least resistance whether it be out into the formation or up and down behind the casing.

Should water or mud be used to break down a formation preceding a squeeze job?—This question has been asked many times. In view of the importance of the question, a number of shallow wells were utilized to evaluate this point.

When considering only the effects of the breakdown agent on the cement squeezed out into a formation, the advantages of water over mud were apparent early in the testing program. For example, shallow well tests showed that when formations were broken down with water prior to squeezing cement, the cement bonded firmly and set hard against the formation.

Squeeze jobs in five shallow wells, where the cement was squeezed through perforations, indicated that water as a breakdown agent is more satisfactory than mud in obtaining perforation shutoffs. Water was used as a breakdown agent in four wells involving multiple squeeze-cementing operations on 43 perforations. Only one of these perforations was not sealed by the cement slurry.

Mud was used as a breakdown agent in three wells involving multiple squeeze-cementing operations on 21 perforations. Of these 21, 4 were found to be open when excavations were made to observe the results. A summation of these shallow well tests showed that approximately 98 per cent of the perforations broken down with water and squeezed with cement were sealed, as compared to an approximate 80 per cent shutoff attained on those squeeze jobs where the formation was broken down with mud.

In considering the possible application of these data to field usage, it should be remembered that the use of water as a breakdown agent presents the possible hazard of a partial drowning of the producing formation. Another objection to the use of water to break down formations is that it may not fracture highly permeable zones.

Mud, on the other hand, will break down highly permeable formations, and in field usage is believed to be less likely to damage oil sands, especially if the mud has low-water-loss characteristics. The injection of mud ahead of cement on squeeze jobs is likely to fracture the formation a greater lateral distance than would water. However, the mud film left on the face of the formation and on the primary cement sheath will tend to prevent a tight bond between the squeezed cement, cement sheath, and the formation. Experimental squeeze jobs in shallow wells at the laboratory, where the effects of breaking down formations with mud were demonstrated, showed that cement will not bond to a cement sheath or sand face covered with mud.

This preliminary shallow-well test work suggests that formations should be broken down with water in preference to mud before squeeze cementing in those cases where the formation characteristics are such as to permit its use; that is, where there is no danger of water blocking the pay and where the permeability is sufficiently low to permit fracturing with water. A low-water mud would be preferable to water for use as a breakdown agent preceding squeeze jobs in formations susceptible to water blocking or in formations of high permeability.

Since neither mud nor water appears to be a satisfactory breakdown agent prior to squeezing cement in all formations, each material having certain advantages and disadvantages, the question is raised as to what would be an improved breakdown agent. Theoretically it appears from a study of the above-mentioned shallow-well tests that a low-water-loss cemented would be a good material for this use since it would not possess the disadvantages of either water or mud.

Can cement be spotted at any desired elevation in the formation?—The objective of some squeeze jobs is to displace the cement slurry into the formation at a given elevation to prevent the vertical migration of undesirable fluids. In order to determine the probability of success of this type of operation, a number of shallow-well squeeze jobs were conducted.

Two methods were utilized to accomplish this purpose. In one method a special tool was used to V-notch the formation before it was broken down, to determine if the breakdown and subsequent cement pancake would be formed in the notch. Two squeeze jobs were conducted in a well under these conditions. In a second method, consisting of high-density shooting, the casing was perforated at the desired level with 12 shots, approximately 30° apart, in a 2-in. band. Following this, the formation was broken down and the well squeeze cemented.

Excavation of these two wells revealed that both of these attempts failed in their purpose. The cement pancake was opposite neither the notches nor the perforations because formation weaknesses found in both wells allowed the fracture to be formed more easily at other than the desired elevation.

These two wells demonstrated that in order to spot a cement pancake at a desired elevation, the formation must be relatively homogeneous. Due to the fact that such formations are seldom encountered in the field, the breakdown agent and the cement slurry will be squeezed out into the isolated section of the formation at the weakest point, whether it be a notch in the formation, a bullet hole, or a weakness caused by a bedding plane or a soft streak in the formation.

Subsequent shallow-well squeeze jobs through perforations in pipe, where the formation was relatively homogeneous, indicated that the cement slurry entry point into the formation could be controlled by the elevation of the perforations. This was demonstrated in a well that was perforated with four shots spaced 90° apart at the same elevation in homogeneous sandstone. The formation was broken down with mud at 550 psi. and four sacks of standard portland cement were squeezed into the formation with a final squeeze pressure of 2,500 psi. Subsequent excavation revealed a horizontal cement pancake with a 360° lateral spread opposite the perforations.

Will squeezed cement completely surround the well bore?—Sometimes it might be desired that cement be squeezed so that it will penetrate the formation parallel to the bedding planes in all directions. This is to be desired in cases where the primary purpose of the job is to minimize the tendency for gas or water coning. In view of this problem, work was performed to determine whether or not cement that is forced out horizontally will completely surround the well bore when it is squeezed through perforations and in open hole.

Open-hole squeeze jobs were performed on nine shallow wells with as many as three successive jobs in one well. In every case a 360° lateral spread of cement was obtained and the cement pancakes appeared to be of better quality and greater thickness than those formed by squeezing through perforations.

In order to determine the lateral spread of cement squeezed through perforations, three shallow wells were utilized. Cement was squeezed out 19 perforations, both singly and in sets, with a resulting average lateral spread of cement of approximately 140° per perforation. A minimum lateral spread

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per perforation of 45° and a maximum of 270° were noted.

It appears from the shallow-well tests that a large number of perforations (possibly 10 or 20 shots) at the point of squeeze will tend to aid in obtaining a uniform squeeze pressure on the outside of the pipe. Then if formation conditions permit, the chances of creating a cement pancake parallel to the bedding planes and completely surrounding the well bore will be improved.

Can perforations in casing be readily plugged by squeezing cement?— It has been demonstrated in field practice that perforations are sometimes difficult to plug by squeezing a cement slurry. This has been evidenced by the fact that many times, several squeeze jobs are required to seal completely one set of perforations. During these shallow-well tests, squeeze jobs were conducted on nine sets of perforations in four wells; five perforations were found to be open after squeezing.

On the other hand, a shallow well that was perforated and squeezed five successive times, one perforation at a time, had no unplugged perforations. An analysis of these test results would seem to indicate that, other factors permitting, a well probably should be perforated with as few shots as practicable at the time of testing; then, if it is found that the perforations must be plugged, they could be squeezed off with minimum effort.

An interesting development that may offer an improved method for sealing multiple perforations involves the use of a low-water-loss cement containing a lost-circulation preventive material. This special cement slurry is believed to be superior to standard cements due to its ability to resist dehydration, thus allowing the cement slurry to be forced into each of the perforations which are successively plugged by the lost circulation material mixed with the slurry. Squeeze-cementing tests, using a low-water-loss cement containing a loss of circulation-preventive material, involving five sets of perforations in five shallow wells were 100 per cent successful in sealing all perforations. To date this material has not been evaluated under deep well conditions.

Can the quantity of cement placed out in the formation be controlled?— Control of the quantity of cement placed out in the formation during a squeeze job is believed to be very important. Field experience has shown that on some wells large quantities of cement may be readily displaced out into the formation before a high final pressure is attained. On other wells it is difficult to displace any appreciable quantity of slurry out into the formation before the cement dehydrates and the pressure increases. It was found in shallow-well tests

(Continued on page 131)

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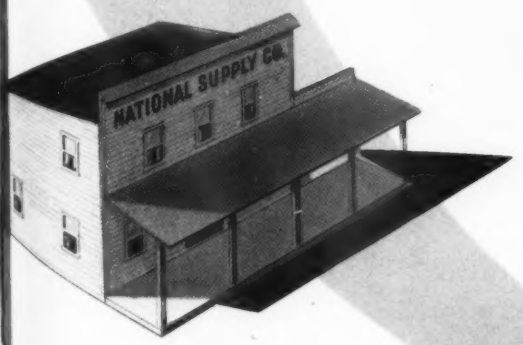

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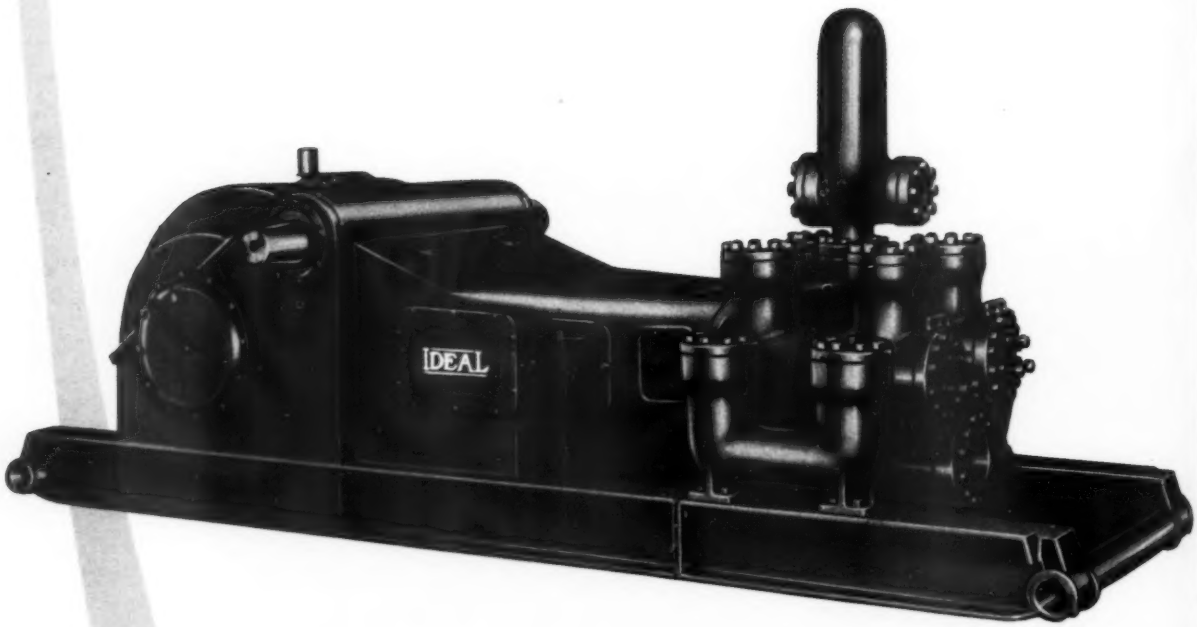

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that the quantity of cement squeezed out into the formation could be controlled to a certain extent by a variation in the squeeze-cementing procedure.

After the formation was broken down, it was possible to inject large quantities of cement slurry into the fracture at a relatively low pressure. In order to limit the quantity of cement placed during these jobs, slow pumping or hesitation pumping was employed. These procedures consisted of placing a predetermined quantity of cement in the normal manner, then either slowing or shutting down the pumps for short periods to initiate a pressure buildup. In this manner it was possible in many instances to attain high final pressures and limit the quantity of cement slurry displaced even in some of the soft streaks encountered in these shallow wells.

Large quantities of cement were displaced into the formation by the use of low-water-loss cement. This is a special cement that has an A.P.I. fluid loss of less than 100 cc. in 30 minutes. Therefore, almost unlimited quantities of this cement can be placed without a pressure buildup because it will resist dehydration. Tests performed in a shallow well permitted the placement of 40 sacks of this cement, with five shutdowns ranging from 5 to 30 minutes without a pressure buildup in 3 hours of pumping. Yet when 10 sacks of standard portland cement were squeezed in a second well under similar conditions, the slurry dehydrated in 30 minutes with a pressure buildup of 2,000 psi.

A number of shallow-well tests were conducted using a phenol formaldehyde-type plastic, with and without inert fillers, as a cementing medium. Generally speaking, the results of these tests were inconclusive due to difficulties experienced with the setting characteristics of the plastic at the low temperatures found at shallow depths. Excavation of these wells revealed that the plastics tested performed the same as cement slurries in the seeking of zones of weakness and in the formation of pancakes.

Before recommending extensive field testing of the improved procedure suggested by the shallow-well squeeze jobs, it was deemed advisable to check, under controlled deep well conditions in the field, the applicability of the slow-pumping or hesitation - pumping squeeze-cementing procedure to field squeeze-cementing operations, and then by subsequent coring determine the direction of travel of the squeezed cement from the well bore.

Two such tests performed in the Gulf Coast area in wells 9,530 and 2,635 ft. deep. These tests, performed in a 3⅞-in.-diameter rathole drilled below 9⅝-in. casing in the first well and 10¾-in. casing on the second, definitely indicated not only that the

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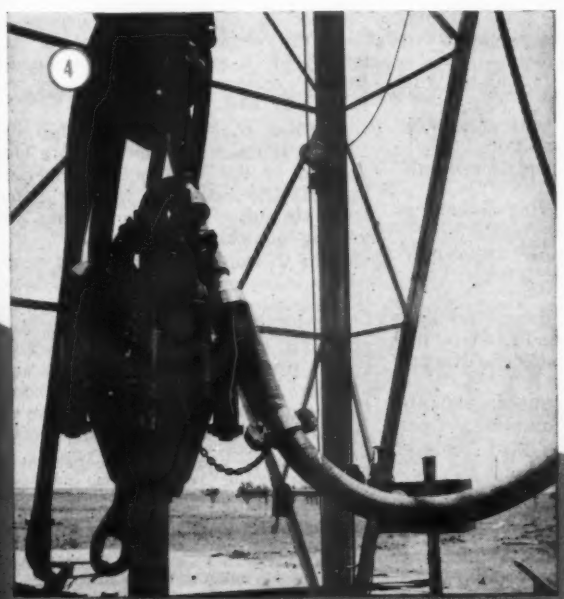

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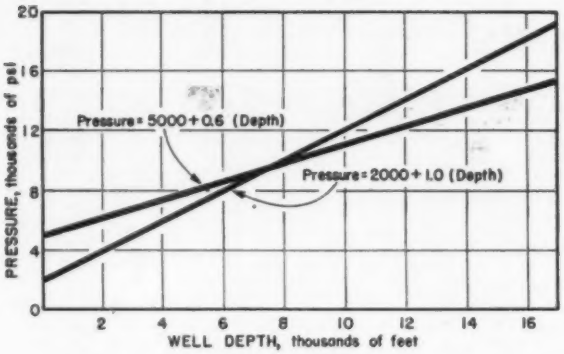

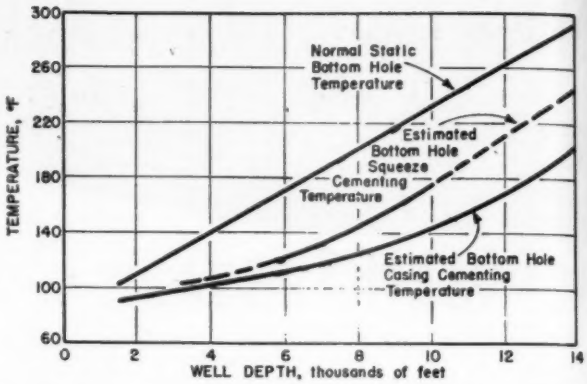
TEMPERATURE, °F
WELL DEPTH, thousands of feet
Normal Static Bottom Hole Temperature
Estimated Bottom Hole Squeeze Cementing Temperature
Estimated Bottom Hole Casing Cementing Temperature

Fig. 3—(Left) Final bottom-hole squeeze pressure. Fig. 4—(Right) Comparison of bottom-hole casing and squeeze-cementing temperatures.

slow-pumping procedure as used in the laboratory was workable, but also furnished additional data for confirmation of the previously established overburden pressure theories.

Coring the ratholes after the squeeze jobs showed that on one well the cement was squeezed out the bottom of the rathole in a vertical fracture, while on the second the cement was squeezed out in a horizontal pancake. These tests illustrated that either type fracture may be formed, depending upon the formation against which the cement is squeezed.

Field Investigation to Determine Proper Squeeze-Cementing Methods

Reviewing the results obtained from the preliminary studies, it became apparent that the ability of a squeeze-cement job to seal perforations is dependent upon the bond obtained between the squeezed cement and the primary cement sheath, rather than on the quantity of cement that can be displaced out into the formation. If the squeezed cement does not bond to the primary cement job, such as to prevent the entry of well fluids into the casing at this point, then all cement squeezed beyond this point serves very little purpose. The initial investigation also indicated that the quantity of cement required to obtain a high final squeeze pressure could be controlled by utilizing special squeeze-cementing techniques.

It is realized that a definite evaluation of a squeeze-cementing procedure should be based on the ability of the squeeze job to accomplish the desired results. However, on many of the squeeze jobs conducted during this series of field tests, well conditions prevented a uniform testing program following each job, making a definite evaluation of the various squeeze-cementing procedures difficult.

As past field experience has indicated that a large majority of the successful squeeze jobs was characterized by a high final squeeze pressure, it appeared that this factor might be used as a criterion for judging various squeeze-cementing procedures. By accepting this line of reasoning, it was then possible to rate a given procedure on the number of sacks of cement with which a high final squeeze pressure was obtained. For example, at the present time only 100 to 125 sacks of cement are required for a squeeze job, as compared to the estimated 250 or more sacks previously used.

Using these premises as the basis for forming an improved squeeze-cementing procedure, a technique was recommended to the field for trial in several wells. The basic assumption was that the slow displacement of a cement slurry, once a breakdown had been obtained, would aid in the dehydration of the slurry, and thus help in compacting the squeezed cement into the perforations to be plugged. This procedure would allow control over the quantity of cement to be displaced before the final squeeze pressure is obtained.

To further verify the aforementioned slow-pumping technique, field tests were set up to investigate each of the following variables:

1. Workability of the slow-pumping or hesitation-pumping squeeze-cementing procedure.
2. Desirability of a high final squeeze pressure.
3. Type of packer best suited for squeeze-cementing operations.
4. Investigation of formation-breakdown agents.
5. Required waiting-on-cement time.
6. Importance of the differential pressure imposed on perforations during testing.

Approximately 160 squeeze-cementing jobs have been conducted in the field to evaluate the aforementioned variables.

The slow-pumping squeeze-cementing procedure used on these field tests consisted principally of the following steps:

1. The squeeze packer was lowered into the well until it was below the zone or perforations to be squeezed.
2. The proper breakdown fluid was circulated to bottom and up into the annulus so that it completely covered the zone to be squeezed.
3. The squeeze packer was raised and set in the pipe a sufficient distance above the perforations to eliminate the hazard of dehydrating cement around the packer.
4. Approximately 150 sacks of cement were mixed and displaced down the tubing, immediately following the breakdown agent.
5. The formation was broken down and 50 sacks of cement were pumped out into the formation at a high pump rate (2 to 3 bbl. per minute).
6. The next 50 sacks were displaced into the formation at a lower pump rate (approximately 1 bbl. per minute).
7. If a pressure buildup had not occurred by the time the third 50 sacks were started into the formation, the pumps were slowed down to a rate of ¼ to ½ bbl. per minute or lower as long as the cement was kept moving. This very slow pumping almost always resulted in a pressure buildup. Hesitation squeezing, or alternate pumping and shutting-down periods, was also found effective, but this practice is somewhat hazardous in that the cement might gel or set while not in motion, and thus resist further movement up or down the tubing or drill pipe.
8. When the pressure buildup occurred, as much surface pressure was applied as the well equipment permitted. The pressure was held for approximately 1 minute before reversing out the excess slurry.

Prior to these tests, the field practice in many areas was to break down the formation with mud and then displace the cement slurry into the formation at as fast a rate as practicable until a pressure buildup occurred and no more cement could be displaced. Frequently, as many as 250 sacks of cement and several stage jobs* would

*Stage job is defined as one part of a squeeze-cementing job on which no pressure buildup is obtained with a predetermined quantity of cement. The perforations are subsequently cleared of cement in preparation for the next stage. This process is repeated until the desired high final squeeze pressure is obtained.

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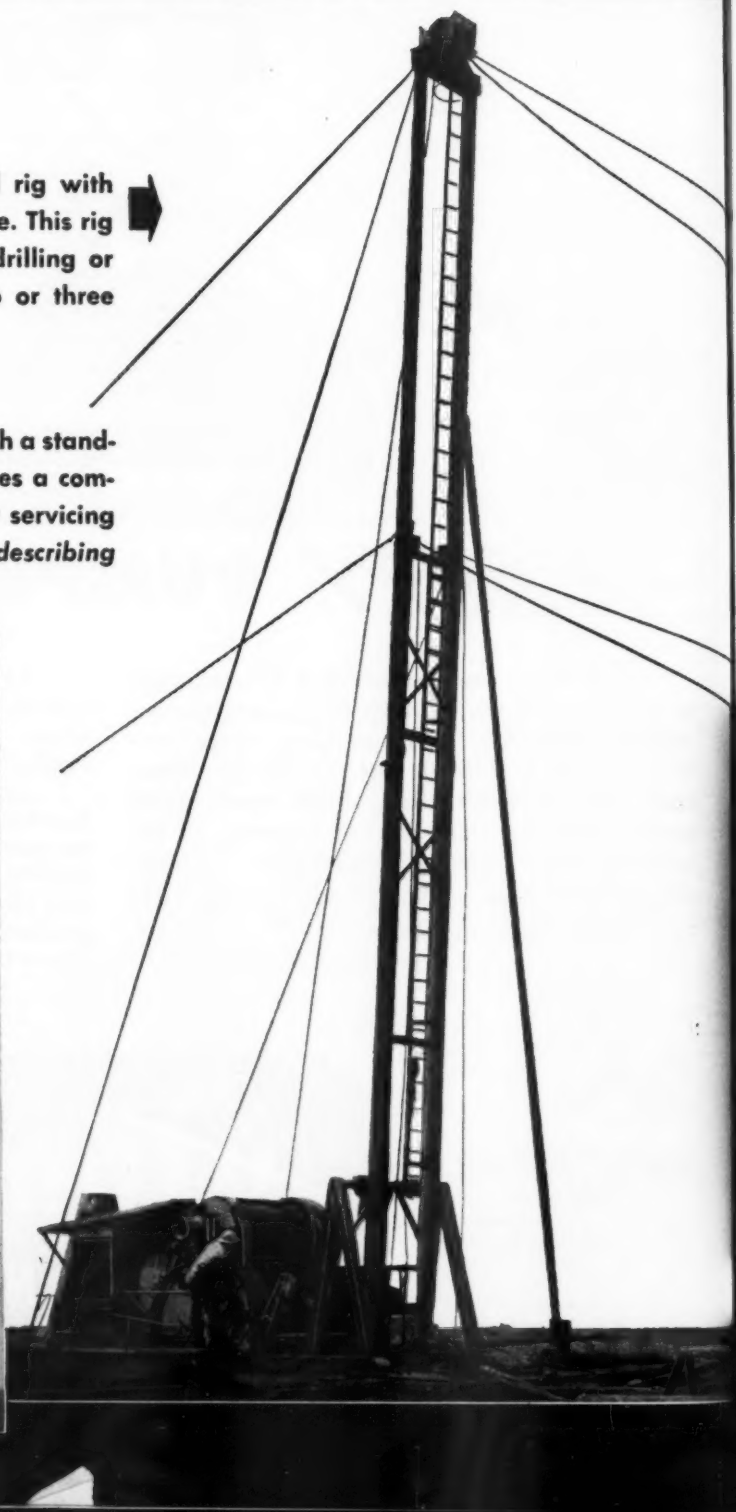

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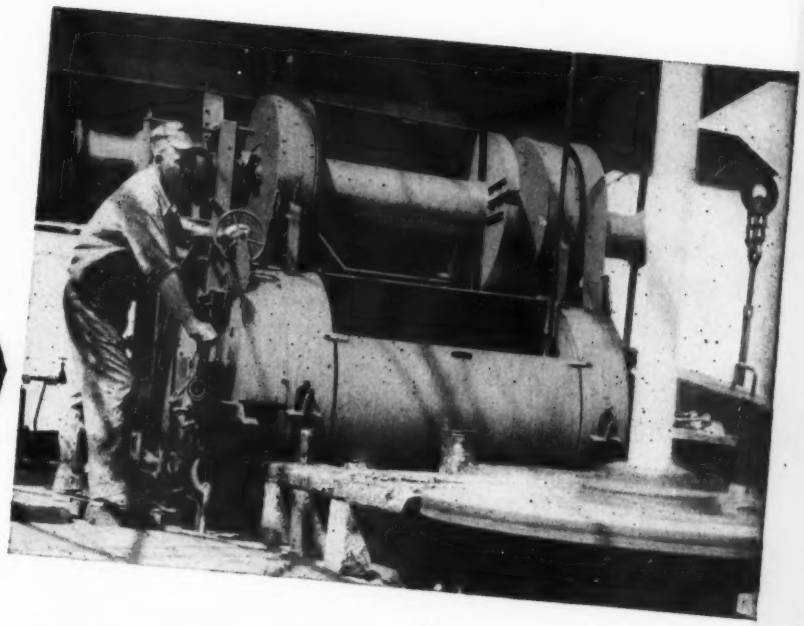
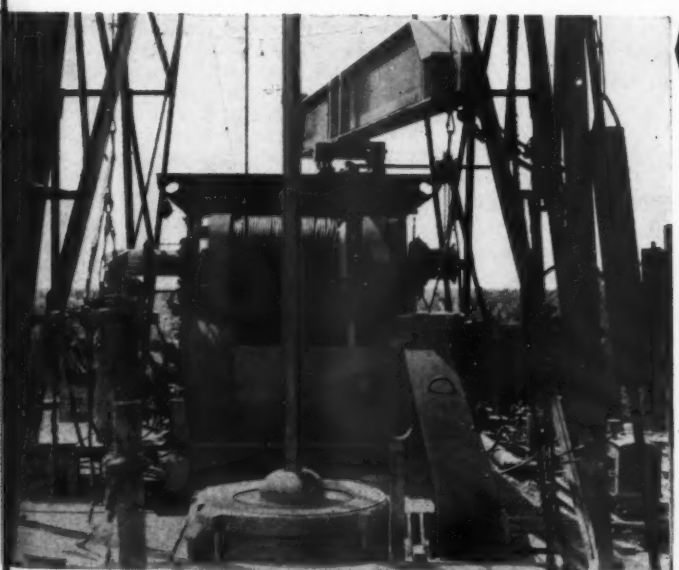
Model R equipped as a double drum draw works. This is the same basic rig as the double spudder shown on the opposite page. The rotary rig can be changed over to cable tool operations to "tail in" for a better producing well in low pressure areas.





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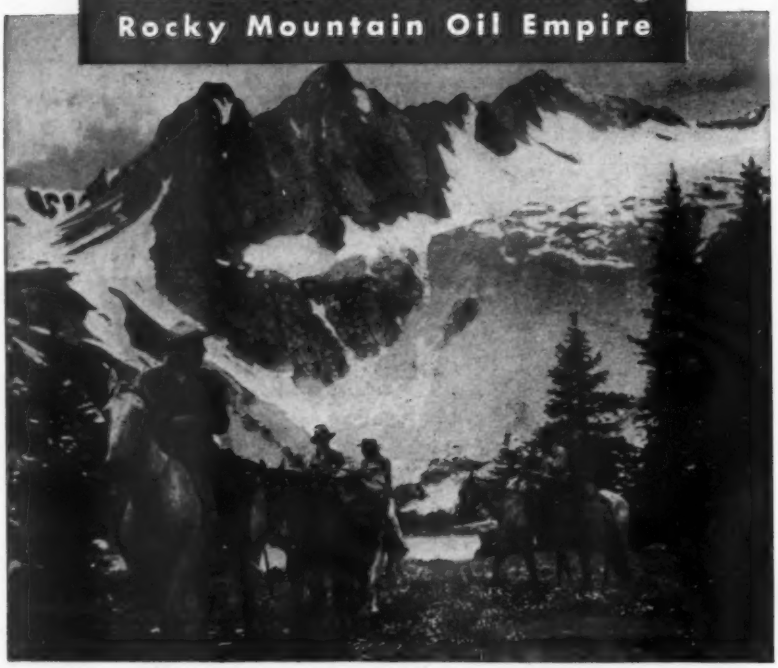

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be required to attain the desired high final squeeze pressure.

An analysis of the fast-pumping squeeze procedure used by the field, and the laboratory experiments previously described, suggested that part of the cement slurry on a field squeeze job was being displaced out into the formation away from the well bore. The pressure buildup was obtained only when sufficient water had been squeezed out of the cement slurry to leave a solid plug which resisted further movement and thus caused a buildup in pressure. The slow-pumping procedure aided this rate of water loss by decreasing the displacement rate and allowing more time for the cement slurry to dehydrate. High final squeeze pressures were thus obtained with much smaller volumes of cement than had previously been possible.

Well conditions on 18 squeeze cementing jobs, all conducted at depths of approximately 6,000 ft., permitted an evaluation of the desirability of obtaining a high final pressure. Nine of the 18 tests resulted in successful jobs, and the other nine failed to shut off all perforations. The bottom-hole squeeze pressures of the successful job average 10,100 psi., or 7,600 psi. differential, while those of the unsuccessful jobs averaged only 7,900 psi., or 5,400 psi. differential. Of course many other factors entered into the determination of success or failure of these jobs, but the over-all difference in final squeeze pressures is believed to be significant.

Required Bottom-Hole Pressure

At the present time field practice in some areas has indicated that a final bottom-hole squeeze-cementing pressure equal to well depth × 1.0 + 2,000 psi. is generally giving satisfactory results. However, limited field experience has indicated that bottom-hole pressures as high as well depth × 0.6 + 5,000 psi. may be required in shallow wells for satisfactory jobs. (See Fig. 3).

During these field tests a study was made to determine if drillable or retrievable cementing packers affected squeeze jobs differently, or if one type of packer would be preferable to the other. At the beginning of these observations it was the thought that the drillable-type packer might be superior to a retrievable packer in that it provided a means for retention of the full final squeeze pressure on the slurry during the entire curing period of the cement. The use of a retrievable-type packer, however, required that all of the surface pressure be bled off before starting the tool out of the well.

An investigation of 109 squeeze jobs, where retrievable packers were used, revealed that only 12 of these jobs were failures. Considering the many other factors that could have contributed to the 12 failures, it is difficult to visualize how any other

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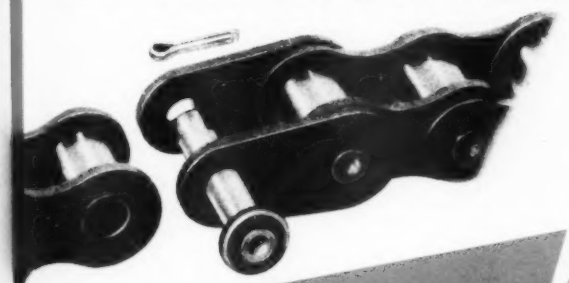

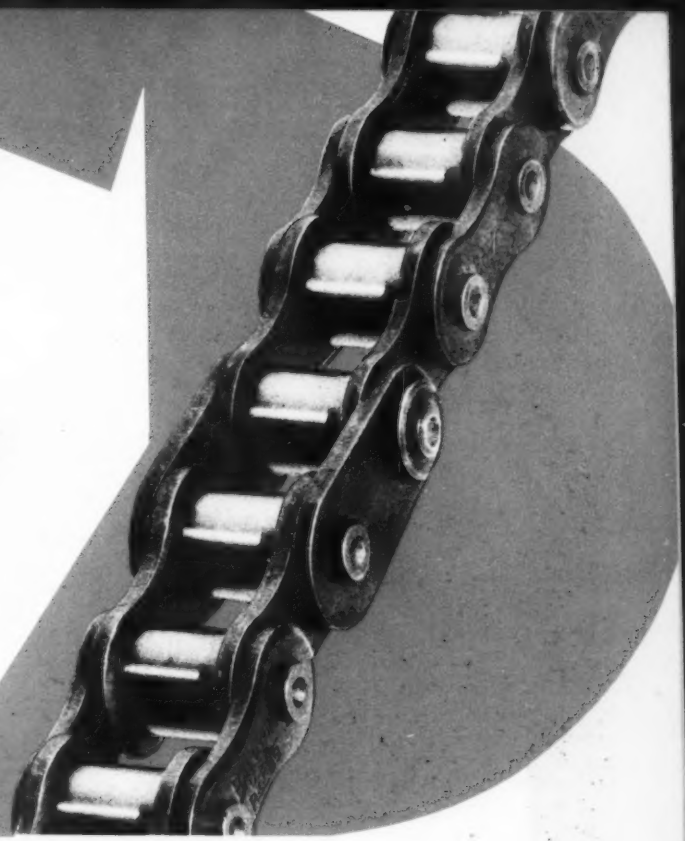

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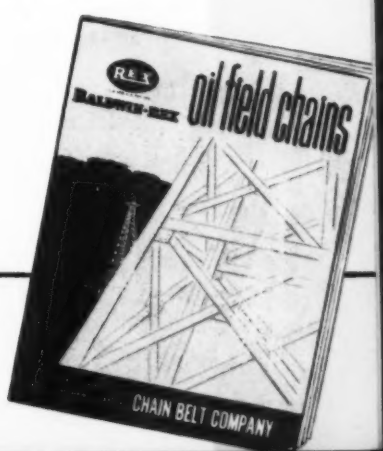

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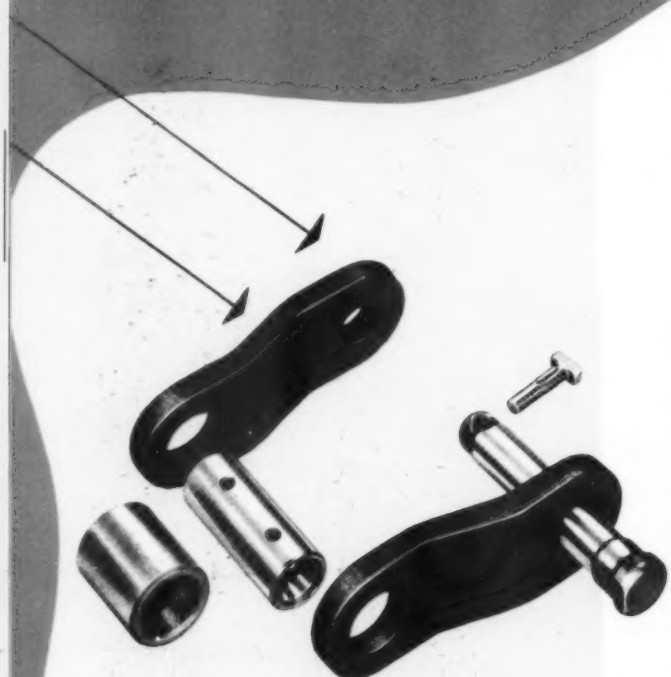

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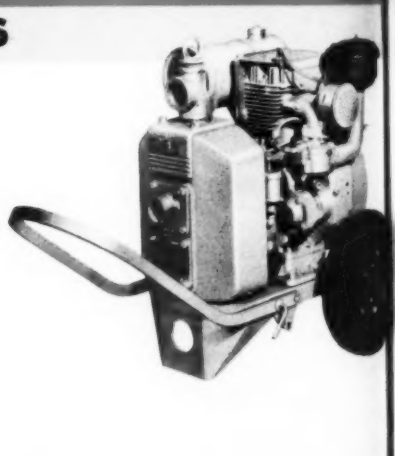

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type tool could provide improved service. It can, based on this data and past field experience, be assumed that both retrievable and drillable-type squeeze packers are satisfactory for squeeze jobs.

The field investigation of formation breakdown agents involved four materials—mud, water, a mixture of hydrochloric and hydrofluoric acids (HCl + HF) and sodium acid pyrophosphate (SAPP). In order to establish a criterion for the three agents, the number of sacks of cement required to obtain a high final squeeze pressure was compared with each breakdown agent used.

Data indicate that mud and water require about the same quantity of cement before a satisfactory pressure can be obtained, but that the mixture of hydrochloric and hydrofluoric acids and sodium acid pyrophosphate appear to be the best breakdown agents tested based on amount of cement required to obtain a high final squeeze pressure. The results obtained with SAPP are encouraging. Additional field experimentation is planned with this material to further confirm these results.

W.O.C. Time

As no definite criterion had been established at the time of these tests for the determination of waiting-on-cement time following squeeze-cementing operations, 24 hours, which is accepted by many operators for casing-cementing operations, was generally employed on this series of experiments. This time was sufficient for every job where it was used and could be evaluated. Since a waiting-on-cement time of less than 24 hours was successfully employed on some of these jobs as well as on other jobs, and since the temperatures and pressures are more severe than those encountered during casing-cementing operations, it appeared that a reduced waiting-on-cement time might be used with reasonable safety.

This was later confirmed by a series of laboratory tests conducted on standard and slow-setting cements under simulated well conditions. The results of these tests indicated that in most instances 18 hours is the optimum waiting-on-cement time following squeeze-cementing operations. The test data, based on the differential pressures which could be imposed across squeezed perforations at various waiting-on-cement times, showed that from 200-1,500 psi. differential pressure could be imposed after 12 to 18 hours depending upon the cement used and the cementing temperature. Similar tests conducted on a low-water-loss cement containing a loss of circulation preventive material indicated that differential pressures in excess of 5,000 psi. could be imposed after waiting-on-cement times of 12 hours.

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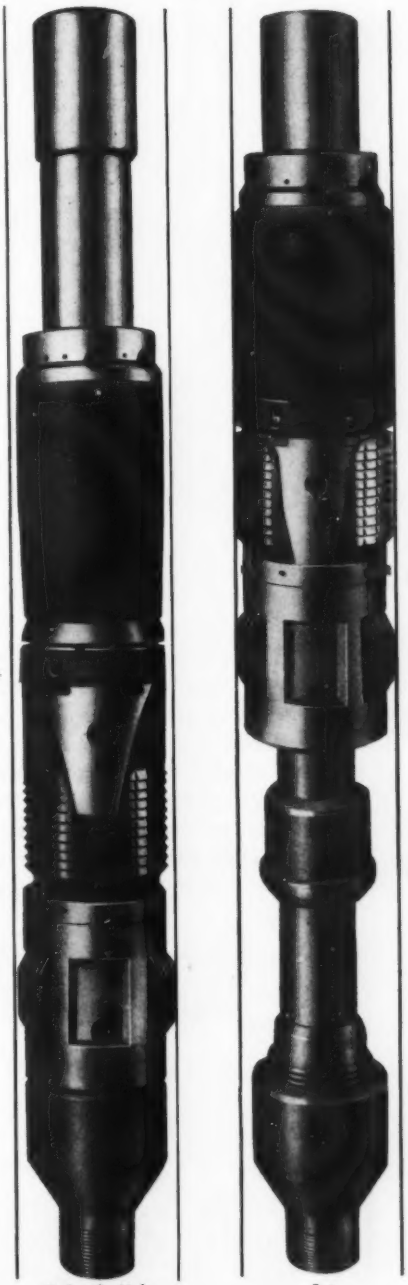

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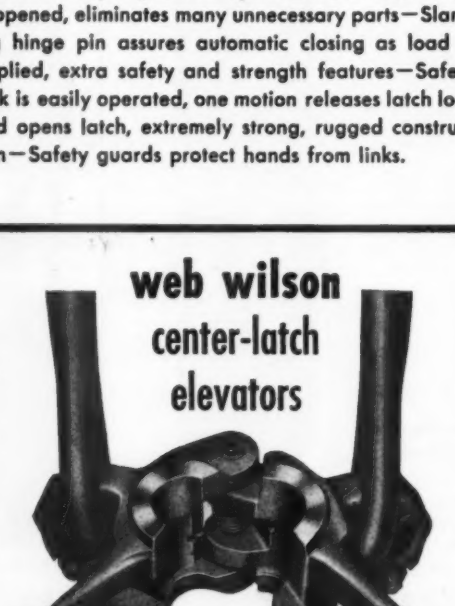

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ing, the pressure differential effected across a section of squeezed-off perforations was found in some instances to be greatly in excess of the pressure that would be imposed across the perforated interval during the remaining life of the well. For example, some wells having producing differentials of 200 to 300 psi. were being tested with differential pressures as high as 2,500 psi. This high differential pressure was apparently a contributing factor in the resulting squeeze-job failures.

Perforation Testing

Believing that these conditions were unnecessarily severe, subsequent perforation testing was performed by imposing only as much differential pressure on the perforated interval being tested as would be imposed during the rest of the producing life of the well. Of the 160 squeeze-cementing jobs reviewed in this investigation, it was possible to obtain complete data on the pressures used in testing the squeezed perforated intervals on only eight jobs. Of these eight, five were tested by imposing pressures comparable to those imposed on the well during its producing life.

In each of the five wells tested the low differential pressure tests showed the squeeze job to be successful. The remaining three jobs were tested using a high differential pressure. Two of the three jobs tested showed an unsuccessful squeeze job, with the remaining well testing satisfactorily.

To date, insufficient data are available to permit accurate evaluation of the cements to be used for squeeze work. Fig. 4 illustrates the difference between the four bottom-hole squeeze-cementing temperatures obtained to date and the casing-cementing temperatures that have been previously established by extensive field tests.* From the limited data on hand at this time it is believed that bottom-hole temperature and pressure conditions are much more severe for squeeze cementing than they are for casing cementing.

Complete evaluations of all cements for squeeze work are planned for the future. Until these data are available, it is believed that care should be exercised in selecting cements for squeeze-cementing operations, since cements tend to set more rapidly under high temperatures and pressures.

Future Developments

Although much work has been done in the past on the improvement of squeeze-cementing techniques and materials, there still remains a great deal of research and development work to be accomplished. There are some phases of this type of operation where the available knowledge is in-

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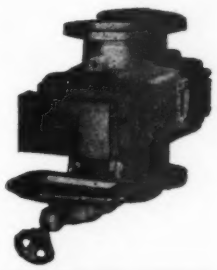

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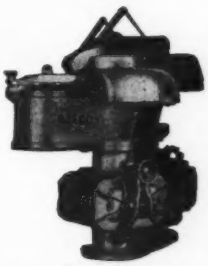

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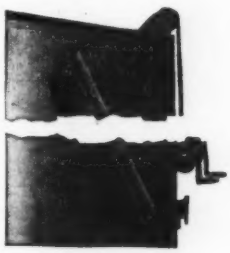

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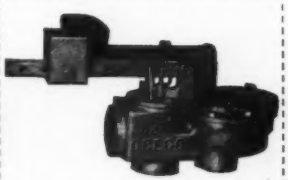

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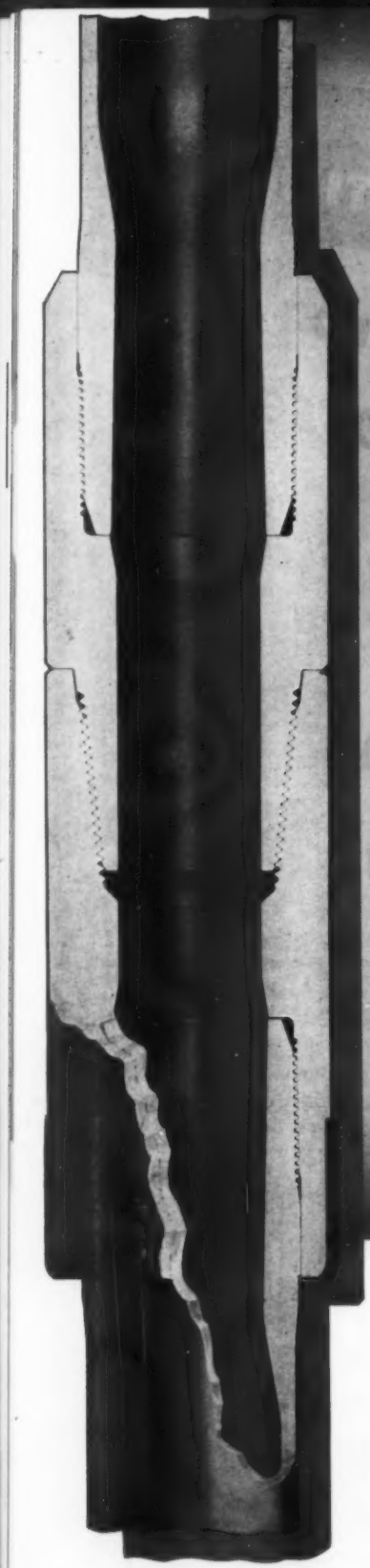

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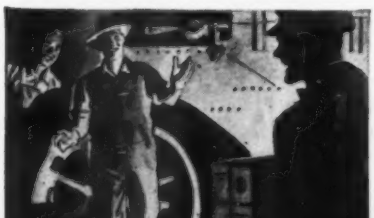

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adequate and others that need improvement. For example, the failure of many squeeze jobs to shut off completely all perforations, even though high final squeeze pressures are obtained, shows the need for improved squeeze-cementing materials and procedures which will allow successive plugging of each perforation and still afford a means of obtaining a high final squeeze pressure.

Considerable thought has also been given to the possibility of squeezing out into a formation an impermeable lens or pancake of cement at selected elevations in a well bore to control the migration of undesirable fluids into the producing well. The lack of definite measurements of bottom-hole squeeze-cementing temperatures represents another limitation of our present squeeze-cementing know-how. The solution to these and other equally important problems will undoubtedly permit further improvement in squeeze-cementing operations.

Acknowledgment

The authors wish to express their appreciation to the management of Stanolind Oil & Gas Co. for permission to prepare and publish this paper, although it is recognized that the granting of such permission does not necessarily imply that Stanolind has incorporated or will incorporate these findings into its operating practice. They also wish to express their appreciation to R. Floyd Farris and R. C. Clark, Jr., for their excellent assistance in accumulating these data; to J. B. Clark for helpful suggestions and criticisms; and to Stanolind Oil & Gas Co.'s division and field personnel for arranging and conducting the field tests.

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12. A. J. Teplitz and W. E. Hassebroek, "An Investigation of Oil-Well Cementing," Drilling and Production Practice, 76 (1946).

American Petroleum Institute Digests

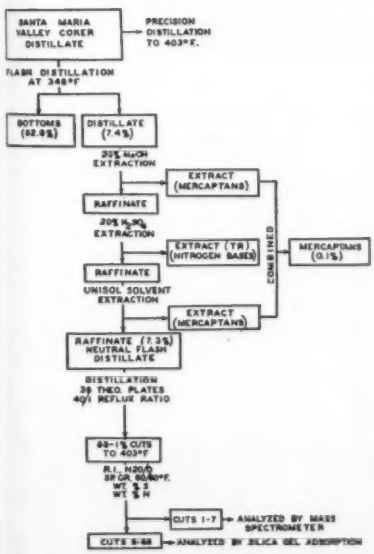
Here are quick-to-read summaries of important petroleum refining papers presented at the midyear A.P.I. meeting held at Cleveland, May 1-4. Several of the papers deal with sulfur, both as to its presence in products and problems created by corrosion. There also is made a report on "Effect of Hydrocarbon Structure on Motor Fuels," and another on the properties and performance of the new gasoline product Platformate.

Analysis of a High-Sulfur Cracked Distillate

JOHN F. WILSON, Union Oil Co. of California, research department, Wilmington, Calif.

AT present a high percentage of the petroleum reserves in this country is of the type known as heavy crudes. Normal refinery processing of such stocks yields large amounts of fuel oil and asphalt and relatively small amounts of more desirable low-boiling products. However, the yield of gasoline can be substantially increased by coking the crude oil. The resulting product, coker distillate, is a complex mixture of saturated olefinic and aromatic hydrocarbons; and, inasmuch as heavy crudes are generally high in sulfur content, coker distillates contain considerable amounts of sulfur compounds.

To aid in determining the most suitable subsequent processing methods, an investigation has been started to determine, as completely as possible, the nature and boiling-point distribution of the compounds constituting a coker distillate from Santa Maria Valley crude oil. The results of the analysis of the fraction boiling below 403° F. are presented at this time.



Outline of experimental analysis.

At the start of the investigation there appeared to be two alternative analytical methods applicable to the problem, viz.: either cutting the stock into fractions, each containing a single chemical type, by silica-gel adsorption and then distilling each of the groups; or, cutting the stock into a series of narrow-boiling-range cuts by precision fractionation and then performing silica-gel adsorption analyses on the cuts.

After some experimentation, the second method was decided upon because it appeared to give more detailed analytical data. This is primarily because the adsorption separations are much sharper when the feed has a narrow boiling range. When the silica-gel adsorption is made first, there is considerable overlap between fractions, and a chemical species present in low concentration is difficult, or impossible, to separate.

The analytical method used is quite similar to that followed by the U. S. Bureau of Mines investigators in their study of shale oil. The main modification has been the extensive use of the refractometer-drum reading in interpreting the adsorption data. The accompanying figure shows the experimental procedure in outline form. The gasoline studied was found to contain 35.9 per cent by volume of paraffins; 19.7 per cent naphthenes; 26.2 per cent olefins; 11.1 per cent aromatic hydrocarbons; 0.3 per cent mercaptans; and 6.8 per cent thiophenes.

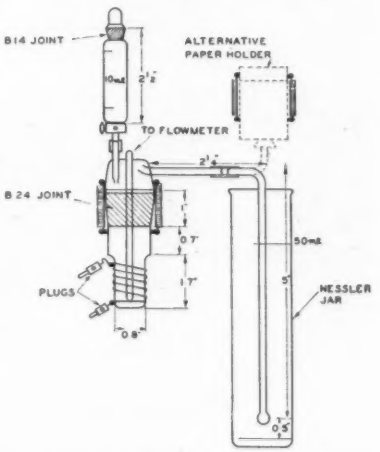
Copper-Strip Test—A Study Of Current Methods of Interpretation and An Examination of Proposed New Procedures

F. W. H. MATTHEWS and D. F. PARSONS, Anglo-Iranian Oil Co., Ltd., research station, Sunbury-on-Thames, Middlesex, England.

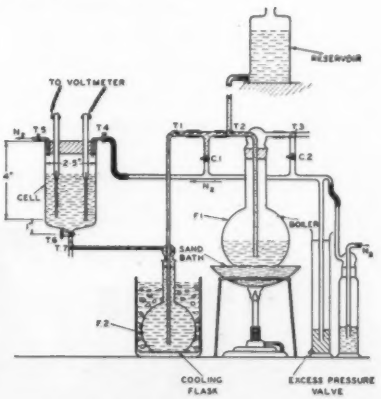
EXPERIENCE in rating tarnished copper strips against specification requirements has long revealed the inadequacy of current standard methods with respect to classifying such strips. Few methods give any guidance as to what colors on a tarnished strip should be regarded as, for example, "slight discoloration."

At first the introduction of the Indiana copper-corrosion standards appeared to be the answer to color-rating problems but in practice, colors intermediate between those listed are obtained, and they have led to further complications. It is, in fact, a rare occurrence to obtain a strip in routine work exactly matching any of these standards, but it is normally possible to make a fair approximation of the order of the relative corrosion indicated by the color.

The idea of attempting to dispense with color classification in rating strips appeared attractive, provided that means could be found which would not unduly prolong the test. The A.S.T.M. D 989 test was considered, and there appeared to be no reason why it should not be more generally ap-



Copper-strip test by the modified "hydrogen sulfide" method.



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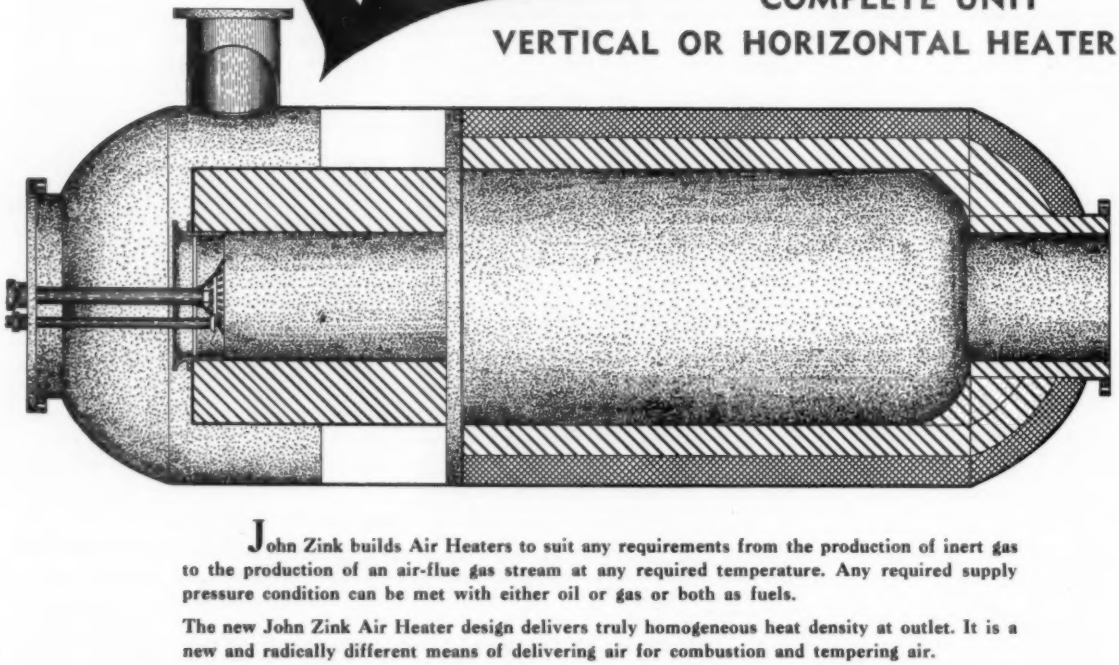

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plied to copper-strip work. It does not, however, claim to be quantitative, and it is too tedious to be of value in dealing with the small quantities of sulfur present on tarnished copper strips.

The "hydrogen sulfide method" showed that it was possible to rate tarnished strips by other chemical means. Although the method seemed promising, it proved to be somewhat empirical and, by comparison with subsequent work, time consuming.

Although the cathodic-reduction - method results are not strictly comparable with the calculated data because of the assumption made in calculation, the agreement is sufficiently close to show that the cathodic-reduction test gives results of the correct order of magnitude for the interference colors examined.

Results by the hydrogen sulfide method bear little comparison with the cathodic-reduction results and, obviously, only a small amount of the sulfur present is detected by this method.

The "cathodic reduction method" appears to have much to recommend it, and conveys detailed information in a very short time. The constituents of the tarnish film can be readily deduced from the time-potential curve, and their quantities can be calculated. The entire operation can be performed in about 15 minutes, which is a small addition only to the main test.

It is believed that the method could with advantage replace color classifications in standard methods, and specifications could then be framed so as to include limits for sulfur by this method instead of the vague terms now used.

Corrosion of Relief Valves In Sour-Crude Service

R. J. HAFSTEN, assistant head engineer, development department, Whiting, Ind., refinery, Standard Oil Co. (Ind.).

THE relief valve is a precision instrument; it cannot be installed and forgotten, but must be inspected and serviced if the optimum in protection is to be obtained. The processing of corrosive materials, such as the high-sulfur crudes, has presented new problems in relief-valve materials, and has necessitated frequent inspection and maintenance.

Minor leaks, which are of no consequence in the processing of noncorrosive stocks, become serious when corrosive stocks are processed. Any measures which are taken to eliminate leaking in a relief valve will usually eliminate the corrosion. However, considering the large number of valves in a refinery, the task of maintaining all of these valves in leakproof condition at all times becomes a practical impossibility.

It has been found that the method of testing a relief valve is extremely important. Valves which pass hydrostatic tests satisfactorily will often leak when tested with air. Similarly, valves tested with air may leak when they are placed in service under different temperature conditions, or when they are used on equipment which contains light vapors which are difficult to "hold." Particles of solid material deposited on the seat when the valve opens during a test or in service may also cause a valve to leak. Unequal tightening of bolts when the valve is installed on equipment has been known to cause leaking.

Shortly after the startup of a vapor-recovery unit, considerable difficulty was encountered with the breaking of carbon-steel relief-valve springs.

To prove that the failures of relief-valve springs were due to hydrogen embrittlement, a failed spring was sectioned. One section was immediately subjected to bending; another section was baked at 400° F. for 4 hours for the purpose of removing hydrogen before testing, and a third section was allowed to remain at room temperature for 3 weeks, to permit escape of hydrogen, before it was subjected to bending. The section of the spring which had been tested immediately failed without any plastic deformation; whereas the other two sections, which had been treated to remove the hydrogen, failed only after considerable plastic deformation had occurred.

Once the cause of the failure had been established, it became evident that eliminating the reaction of $Fe + H_2S \rightarrow FeS + 2H$ would put a stop to the spring failures. In this particular instance the carbon - steel springs were replaced with springs which had been metallized with aluminum. No failures have occurred in approximately 3 years.

A spring manufactured from one of the 18 per cent chromium 8 per cent nickel steels would also have been suitable and more permanent than an aluminum coating, inasmuch as the coating can become damaged or flake off, thus exposing the spring to corrosion.

From a safety standpoint, corrosion of the disk guide is more serious than failure of the relief-valve springs for the reason that the corrosion product formed on the surface of the guide, and in the small clearance between the disk and disk guide, restricts the movement of the disk and prevents the valve from functioning properly.

To meet the problem, the inside surfaces of a number of disk guides were electroplated with hard chromium. Chromium plate was selected because an immediate solution was necessary. Hard chromium plate had previously indicated ability to resist hydrogen sulfide corrosion, and it appeared to be especially desirable as a relief-valve material because of its low coefficient of friction.

Several thermal cracking units were converted from processing low-sulfur stocks to the processing of high-sulfur stocks. Although alloy steel was substituted for carbon steel where this was needed in the units, no change was made in relief-valve materials. The relief valves were of the spring-loaded nozzle type.

Main parts of the valve consisted of 17 to 20 per cent chromium-steel guides and 8 per cent chromium 18 per cent nickel steel nozzles and disks. Because of their high alloy content, it was thought that the valves would be satisfactory for the processing of sour crudes. The units operated on a West Texas gas oil which contained an average sulfur content of 1.23 per cent by weight.

Approximately a year after the startup of the units the relief valves began to leak. It became necessary to reduce operating pressures in order to keep units running, and eventually one unit was shut down because the relief valve had apparently "popped" and had not reseated itself. Visual examination of this valve disclosed that a portion of the nozzle had broken off. The surface of the nozzle was pitted; and a dark corrosion product, identified as metallic sulfides, was evident.

Metallurgical investigation revealed that severe intergranular corrosion had taken place. It was evident that the 8 per cent chromium 18 per cent nickel steel alloy was susceptible to intergranular corrosion when exposed at a temperature of 900° F. to the concentration of hydrogen sulfide encountered in the unit.

The problem was met by substituting 18 per cent chromium 8 per cent nickel steel for the 8 per cent chromium 18 per cent nickel steel. It appears that, if the chromium predominates, the alloy resists the corrosive action of hot hydrogen sulfide and other sulfur-bearing gases very well; but, if nickel predominates as in the 8 per cent chromium 18 per cent nickel composition, the alloy behaves similarly to nickel, and is vulnerable to the attack of hot sulfur gases.

Effects of Sulfur in Motor Gasoline on Engine Operation

R. E. JEFFREY, Shell Oil Co., San Francisco; J. B. DUCKWORTH, Standard Oil Co. (Ind.), and E. J. GAY, consultant, Detroit.

THIS paper presents the results of cooperate work carried out to investigate the effects of sulfur in motor gasoline on engine operation. The American Petroleum Institute and the Society of Automotive Engineers jointly supported this test program, under the sponsorship of the Coordinating Research Council, Inc.

The investigation was directed toward acquiring factual data regarding the effect on engines of sulfur in motor gasoline. The scope of the program was limited to the technical aspects of sulfur in motor gasoline, and did not include an evaluation of economic considerations which are a part of the broad over-all problem.

The test data reported show that the influence of up to 0.3 per cent sulfur in gasoline, as compared to gasolines of 0.1 per cent sulfur and lower, may vary from a pronounced effect on cylinder and ring wear, under some operating conditions, to no effect under continuous operation at normal engine temperature. This increased wear, to a considerable extent, does not check general field-service experience, even in the areas where high-sulfur gasolines have been widely used.

It is the opinion of the authors of this paper that there is ample material for study in the C.R.C. report on sulfur in motor gasoline. The engine manufacturer and petroleum refiner may wish to do further work with their own products—using their own test facilities, following the several avenues of investigation which are open to both.

Effect of Hydrocarbon Structure on the Road Antiknock Performance of Motor Fuels

T. B. PRICKETT, M. H. CAMPBELL, R. L. JOHNSON, and D. A. KNEE, Petroleum Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

VARIOUS road knock-test investigations during the past decade have indicated that certain alterations can be made in the chemical types of hydrocarbons in the gasoline boiling range to give somewhat better road antiknock performance and lead response than that which might be predicted from laboratory knock-test data. That is, a road performance "dividend" can be gained by skillful blending.

In view of the current major engine-design trend towards increased compression ratio and the present emphasis on higher octane gasolines, it is desirable to reexamine the fuel chemical characteristics involved in obtaining maximum road antiknock performance and lead response.

Although previous investigations have been valuable, they have been of a practical rather than basic nature. For this reason, information on the road knock effects of variations in basic gasoline hydrocarbon types in both modern and future engines is not available.

The extreme seriousness of the problem has made it necessary for refiners to experiment more than ever before with various combinations of refinery streams. These studies could be simplified by data on the effects of fundamental, complete changes in gasoline hydrocarbon type throughout the boiling range on road antiknock performance in current model engines and in engines of higher compression ratio.

To provide such information, a typical commercial-type base stock was altered by substitution of different hydrocarbon types in both the low and high-boiling fractions. Fourteen basically different blends prepared in this manner, each clear and leaded 1.0 and 3.0 cc. per gallon, were road tested by the Modified Borderline and Modified Uniontown procedures.

To make certain that reliable data were obtained, each determination was made at least twice. In all, a total of some 2,500 separate road ratings were made on the 42 leaded and unleaded blends in this program. These data have been analyzed to show the effects of (1) fuel chemical type and (2) engine type and compression

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ratio on road antiknock performance. It is the particular objective of this paper to show how road ratings can be improved or modified relative to laboratory knock ratings by changes in the hydrocarbon structure of a gasoline.

Conclusions

1. The major effects of car type on road antiknock ratings with the basically different fuels of this program were:

(a). The four types of standard compression ratio cars responded very similarly to the different fuel compositions investigated.

(b). In high-compression-ratio cars, at high speed, the road ratings of the fuels increased markedly with compression ratio, thus making the road octane numbers of all fuels more nearly constant throughout the speed range.

2. Considering **only** the carryover of laboratory antiknock value to the road, the following tendencies are evident:

(a). In standard compression ratio cars: (1) For a given research octane number, paraffinic insertions in either light or heavy ends of the fuels gave better over-all road octane performance than other inserts. (2). The addition of 1.0 cc. of tetraethyl lead per gallon to the test fuels raised road octane numbers slightly less than laboratory octane numbers. Increasing tetraethyl lead concentration from the 1.0 to the 3.0-cc. per gallon level increased road octane numbers somewhat more than laboratory octane numbers.

(b). In high-compression-ratio cars, front-end olefinic insertions gave higher octane numbers on the road relative to the laboratory than did paraffins. There was little effect of heavy-end chemical type changes on road performance at 10 : 1 compression ratio.

The significance of these conclusions is that in the selection of the chemical make-up of gasolines to give best road antiknock performance for a given level of laboratory Research antiknock quality:

1. In present-day cars, the use of a substantial amount of paraffins is desirable.

2. Based on one type of engine only, for compression ratios substantially above those in current use olefinic fuels may be expected to exhibit slightly better road response than those which are predominantly paraffinic in composition.

Road Effectiveness of Tetraethyl Lead as Influenced By Added Sulfur

DONALD H. PULLEYBLANK and WHEELER G. LOVELL, Ethyl Corp. Research Laboratories, Detroit.

THE effect of added sulfur in 11 current commercial fuels which contains tetraethyl lead was investigated in laboratory knock-test engines and in current automobiles on the chassis dynamometer. The ratios of volumes of tetraethyl lead required in the presence of different sulfur contents for the same antiknock value (called tetraethyl lead efficiency or fraction of tetraethyl lead effective) were determined and compared.

The effect of sulfur in automobile engines was consistently less than in either the "motor" or the "research method" knock-test engines. The average of the automobile data shows that the change in tetraethyl lead required, or the loss of octane number accompanying the addition of sulfur compounds, is only about one-half of that indicated by the laboratory knock-test engines. In some tests added sulfur had no noticeable effect on knock ratings or tetraethyl lead efficiencies obtained in cars. Part of this discrepancy between road and laboratory effects of sulfur may be attributed to separation and maldistribution of fuel components in the automobile-engine manifold during acceleration.

The effect of the sulfur originally present in the fuels was estimated from analyses of the sulfur types in the fuels and from laboratory data on the influence of the sulfur compounds present. The sulfur-type analyses indicate that the 11 fuels examined have an average sulfur content of 0.09 per cent, and have a computed laboratory tetraethyl lead efficiency of about 46 per cent, on the basis of the fuel being absolutely sulfur free.

Rapid X-ray Determination of Sulfur in Distillate Fuels

HAROLD K. HUGHES and JOHN W. WILCZEWSKI, Socony-Vacuum Laboratories, technical service department, Brooklyn.

AN X-ray absorption method for the determination of sulfur in light products is being applied to kerosine, diesel fuel, gas-enrichment oils, and light fuel oils. It is probably also applicable to other hydrocarbons when carbon, hydrogen, and sulfur are the only elements present in appreciable concentrations. It is not suitable for leaded gasolines, compounded motor oils, or cutting oils. Its applicability to additive-type fuel oils has not been determined.

The method is adequately accurate for many of the routine samples which come to a petroleum laboratory for analysis—it being estimated that reported values are in error by no more than 0.09 per cent sulfur, on the average. As a monitor on streams of relatively constant composition, the accuracy should approach the repeatability which is 0.02 per cent sulfur or better.

In conformity with other X-ray absorption methods, this one for sulfur is extremely rapid—determinations requiring only 7 minutes. No preparation of the sample is involved. A nontechnical operator is now running all samples.

Both in outline and in practice, the method is quite simple, and it appears to

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☐ **Serial No. 56 — "Some Properties of Technically Important Hexavalent Chromium Compounds."**

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be about as straightforward as a method can be. All materials absorb X-rays—some more than others. If the transmittance of a sample is measured quantitatively, as with a geiger-counter detector, this can be correlated with the concentration of sulfur—high-concentration samples being more opaque than low ones.

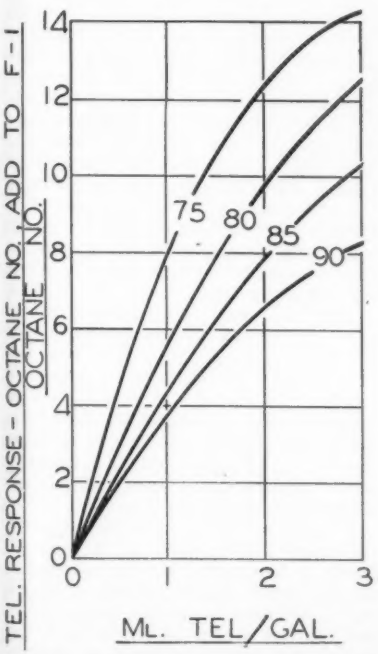
The initial radiant power of a beam of X-rays is monitored with a standard absorber in the path; then the sample is poured into a suitable absorption cell, and the transmitted power is measured. The transmittance is computed from these two readings of the time required for 10,000 quanta to be registered by the detector.

This X-ray absorption procedure for the determination of sulfur in distillate fuels is considerably faster than both the A.S.T.M. bomb (D 129-49) and the lamp (D 90-47T) methods. One determination requires about 7 minutes, including filling and cleaning of the cell and all computations. Preliminary adjustments of the apparatus may take up to 15 minutes, but this is unnecessary if the apparatus has not been disturbed. Inasmuch as, in this laboratory, the same X-ray apparatus is employed for X-ray-diffraction analyses, change of tubes and alignment of the goniometer are generally required.

Platformate—Properties And Performance

J. S. BOGEN and V. HAENSEL, Universal Oil Products Co., Riverside, Ill.

THE new gasoline, "Platformate," offers unusual properties to benefit the refiner and natural gasoline producer who must meet the ever-rising octane number demand. Because of the high octane requirements of modern motor vehicles, the refiner today finds that he must develop new and better means of upgrading his low-gravity gasoline components. In an effort to help the refiner solve this problem, Universal Oil Products Co. has invented and developed a new process which is called "Platforming." This process is simple and inexpensive, and it reforms a charge of poor-quality straightrun or blends of straightrun and heavy thermal cracked.



Increase in octane number vs. ml. TEL per gallon added, for platformate from Mid-Continent straightrun naphtha.

Leaded F-1 octane numbers as high as isooctane + 0.5 ml. TEL per gallon have been obtained on pilot-plant runs, and leaded F-1 octane numbers exceeding 96 have been obtained in commercial operation using a Michigan straightrun charge stock. These high octane numbers are obtained at yields of 92 per cent or more.

All the physical inspection properties of platformate fall within the limits of normal motor-fuel characteristics regardless of the crude source from which it is produced. By varying plant operation and feed-stock boiling range, it is possible to produce platformate with end points over 400° F. without sacrificing quality.

One of the interesting properties of the platforming process is the excellent sulfur removal. The per cent sulfur reduction is independent of the final octane number of the platformate. Typical final total sulfur percentages vary from 0.002 to 0.005. The initial sulfur content has no bearing on the desulfurization; high sulfur stocks are desulfurized to the same low level as are low-sulfur stocks..

Platformate is inherently a stable type of gasoline because of its hydrocarbon composition. It is nonolefinic and is composed primarily of isoparaffins and aromatics. The material has an induction period of more than 1,150 minutes and a 5-hour accelerated gum of less than 1 mg. per 100 ml. The addition of 0.001 per cent of U.O.P. No. 5 gasoline antioxidant stabilizes tetraethyl lead in the platformate in concentration of 3 ml. per gallon. Inhibition of platformate is required only to stabilize the tetraethyl lead, as in the case of straightrun gasolines.

One of the most important properties of platformate is its octane rating. The response of platformate to the addition of tetraethyl lead is excellent, comparing quite

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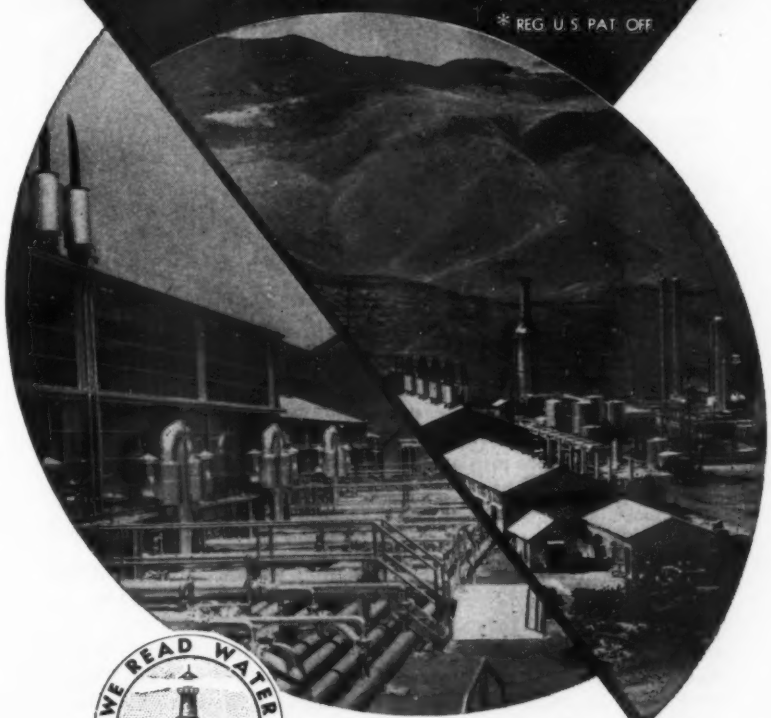

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favorably with the response of the straight-run gasoline, despite the high-octane-number level of the platformate. This lead response is much greater than that of the products of other refining processes such as catalytic cracking, thermal cracking, thermal reforming, and polymerization.

The gain in octane number by adding tetraethyl lead to Mid-Continent platformate is shown in the accompanying figure. The use of this chart is illustrated best by an example. Let us assume that we have a Mid-Continent platformate which has an 85 F-1 clear octane number, and we wish to know the F-1 octane number with the addition of 3.0 ml. TEL per gallon. We find that the 85 line crosses the 3.0-ml. line at 10.3. The final octane number is then 85 + 10.3, or 95.3.

It has been found that heavy thermal cracked may be platformed to produce a gasoline which is high in octane number, low in sulfur content, and high in storage stability. The reduction in sulfur content is of the same order of magnitude as that achieved when processing straight-run charge stocks.

The blending characteristics of platformate with other refinery products are of interest in evaluating the place of this new process in the over-all refinery picture.

Conclusion

The process is outstanding for reforming straightrun or a straightrun heavy thermal cracked blend because:

1. The laboratory knock ratings are upgraded by as much as 50 octane numbers.
2. The lead susceptibility of the product is excellent.
3. The road performance of platformate is higher than would be predicted from the laboratory knock ratings, in many cases equaling or exceeding the F-1 octane number.
4. The hydrocarbon composition, isoparaffinic and aromatic, results in the fuel being appreciated by the coming high-compression, high-power engines.
5. Sulfur reduction of 90 per cent or more is obtained.
6. The product is as stable as straightrun. Inhibitor is needed only to stabilize the tetraethyl lead.

It should be recognized that the specific values apply only to the samples in question, but the trends and differentials are applicable to similar stocks and blends.

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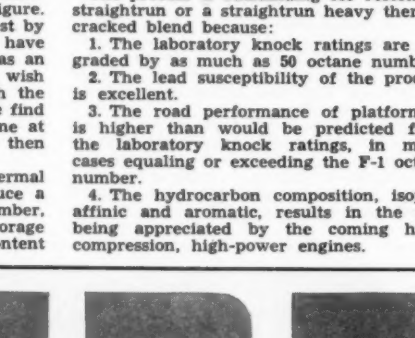

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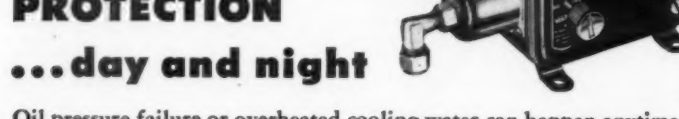

AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, PUMPS, AIR COMPRESSORS, ENGINES, GAS RANGES

Job Design

(Continued from page 108)

The third step was to design a truck body for the transportation of these tools and equipment. Tool boxes were designed to provide a convenient place to keep each hand tool and each repair part. In addition to small hand tools, this truck is provided with a winch, shear poles, and a cutting torch.

The use of this truck resulted in a reduction in the time lost searching for tools or parts, elimination of extra trips back to headquarters for additional tools or repair parts, elimination of idle time waiting on a welder, reduction in the number of tools lost or damaged, and enabled a two-man crew effectively to perform work previously requiring larger crews.

Pumping Operations

The oil-field pumper in the ordinary course of work must perform a wide variety of jobs in looking after one or more wells, maintaining engines in operation, checking production into tank batteries, maintaining lease appearance, and making minor adjustments and repairs to equipment. In his work the pumper is usually left to his own resources in arranging and carrying out his work. Perhaps in no oil-field activity is there greater opportunity to develop job routine through custom or through personal habits. In the absence of job analysis, pumpers may engage in many unnecessary activities which decrease the amount of useful work they can perform. Many trips are made to wells, tank batteries, and other facilities to check operation or to perform some operation manually which could be done mechanically.

The first step in making a study is to determine what a pumper does in the ordinary course so that the unnecessary or ineffective activities can be eliminated. Fig. 5 is a portion of an activity chart which shows the activities performed by a pumper during a day's work. The relationship between time spent on various items of work is shown in Fig. 6.

Travel time.—By determining the frequency each item of equipment needs to be inspected or serviced for proper operation, by planning routes to be followed in the performance of the regular items of work, and the installation of automatic or labor-saving equipment such as shutdown devices and tank-battery topping lines, travel time can be reduced.

In one field involving 270 wells and 14 jobs, covering an area of approximately 2,000 acres, the required walking distance per day was reduced from 75 to 40 miles. Fig. 7 shows the pattern traveled by various pumpers in a portion of this field prior to job design. Fig. 8 shows the travel routes designed upon completion of a method study.

Items of equipment have been developed which have diminished the amount of travel by making it unnecessary for a pumper to be at a particular location at a particular time. These items include time-clock-actuated automatic hookoffs for rod lines, automatic shutdown valves for gas engines which eliminate the need for the pumper making a return trip to the well to shut the engine down, topping lines on tank batteries which will top a tank to the desired level and eliminate the need of a pumper or switcher returning to the tank battery for this purpose. Friction starters have been installed on horizontal engines to reduce the physical requirements of the job.

Obtaining and Analyzing Information

The necessary data and information required to determine where improvements are possible, how they can be accomplished, and their economic value are obtained from three sources:

1. Observing the work in progress, recording elements of work and the time required to perform them.
2. Operating reports and equipment records.
3. Discussion with supervisors and operating personnel.

The information thus obtained is assembled and compiled. Each activity is then analyzed by subjecting it to questions: "What is the purpose of the activity?" "What would happen if it were not done?" "How else might it be accomplished?" "How frequently should it be performed?" Once the answers to these questions are found, the essential activities necessary to accomplish the over-all objectives can be determined and the various jobs designed so that properties can be operated with a minimum expenditure of time and effort, and the quality of the work improved.

Conclusion

The result of 10 years of experience shows conclusively that the application of methods studies to job design will result in:

1. A basis for the determination of a fair and reasonable amount of work for each employe.
2. The improvement of working conditions and a reduction in the amount of physical effort required to accomplish a task in the safest manner.
3. The promotion of greater efficiency with a higher quality of work through elimination of unessential activity, the development of improved tools and equipment, and the most desirable arrangement of the work and the sequence of performing the various elements of the job.

To achieve these results through method study and job design is to raise the standards of work and to improve working conditions in the petroleum industry.

BOOKS

GEOPHYSICS. Published as Vol. 45, No. 4A, of the Quarterly of Colorado School of Mines, Golden, Colo. 103 pp. $1.

This is a number of the seventy-fifth anniversary volume entitled "Mineral Resources in World Affairs," which will make available all of the papers presented and much of the discussion at the conferences on the occasion of the school's seventy-fifth anniversary. The current issue contains the papers delivered at the conference on geophysics September 30 and October 1, 1949. Included are "The Relationship of Research and Field Operations in Seismic Exploration," by Cecil H. Green, vice president, Geophysical Service, Inc., Dallas; "Geological Imagination in the Interpretation of Geophysical Data," by R. Clare Coffin, Stanolind Oil & Gas Co., Tulsa; "Current Trends and Progress in Mining Geophysics," by Hans Lundberg, president, Lundberg Explorations, Ltd., Toronto; "Recent Developments in Electrical Logging and Auxiliary Methods," by H. G. Doll and Maurice Martin, Schlumberger Well Surveying Corp., Ridgefield, Conn.; "Recent Developments in Seismic Research," by D. H. Clewell, Magnolia Petroleum Co., Dallas; and "Recent Developments in Gravity Prospecting," by Sigmund Hammer, Gulf Research & Development Co., Pittsburgh.

Statement of Condition April 24, 1950

RESOURCES

Cash and Due from Banks		$ 90,187,151.17
U. S. Government Securities		60,201,244.62
State, Municipal and Other Securities		1,315,636.05
Stock in Federal Reserve Bank		825,000.00
Loans and Discounts		155,063,047.31
Bills of Exchange and Commodity Loans		14,682,073.07
Bank Premises and Equipment		2,351,076.27
Real Estate for Bank Expansion		2,326,896.03
Acceptances — Customers Account		2,560,186.04
TOTAL		$329,512,310.56

LIABILITIES

Capital	$ 13,500,000.00	
Surplus	14,000,000.00	
Undivided Profits	2,980,371.31	30,480,371.31
Reserve for Contingencies		2,502,908.33
Reserve for Taxes, etc.		1,251,013.23
Acceptances — Customers Account		2,590,186.04
Deposits:		
Individual	$203,021,779.09	
Banks	85,145,268.02	
U. S. Government	4,520,784.54	292,687,831.65
TOTAL		$329,512,310.56

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Benoist Water Flood

(Continued from page 111)

is pumped into a 500-g.p.m. Accelator (Infilco, Inc.) or water stabilizer. In the Accelator, water is treated with approximately 6 lb. of ferric chloride and 20 lb. of lime per 1,000 bbl. During cold weather, it is necessary to feed activated sodium silicate to obtain proper flocculation and settling in the Accelator. After chemical treatment, the water flows by gravity through sand and gravel pressure filters.

The water at the filter outlet is picked up by centrifugal pumps and distributed to the field. Small single-stage centrifugal pumps were initially installed and as the pressure requirements increased, larger centrifugal pumps were added. The present distribution pump is a 4 by 3-in. multistage centrifugal pump that has a capacity of 400 g.p.m. against 500 psi. pressure and is driven by a 200-hp. electric motor.

The distribution system is made up of a 6-in. main line running through the field with 4, 3, and 2-in. laterals. The major part of the distribution system is of bare pipe except the later extensions which have been cement lined or plastic coated.

The average characteristics of the injected water are as follows:

Methyl orange alkalinity, p.p.m.	50
Calcium carbonate super saturation, p.p.m.	4-6
pH	7.5-7.7
Total iron, p.p.m.	0.1
Dissolved oxygen, p.p.m.	4-6
Turbidity, p.p.m.	less than 0.5

Most of the wells started off taking the desired amount of water on vacuum and later went on pressure. In some of the tighter areas, it has been necessary to set booster pumps to inject the desired amount of water.

Fig. 2 is the water-injection curve for W-18 Meryman and it represents about the average intake performance for the flood. This well is one of the pilot-flood intakes and it can be seen that the injection rate was stepped up above average in the beginning. The injection curve shows a decreasing rate during 1946 but after acidizing, the rate came up again.

A number of the wells have shown evidence of well bore plugging while others have not. Some of them have been acidized with good results while others have required reshooting. In general, the water intakes have taken the desired amount of water without undue difficulty.

Oil-Well Performance

The oil wells, before water flood, were produced from 2 to 12 bbl. of oil per day with a field average of 9 bbl. per day. From 5 to 7 months after the start of injection, a pattern oil well received its initial kick and the oil production gradually increased to a maximum of approximately 200 bbl. of oil per day.

Fig. 3 is a performance curve for O-18 Meryman. The well is also one of the pilot flood wells and its performance has been about average for the flood. This well reached a maximum oil production slightly above 200 bbl. per day and produced all oil for approximately 1 year. This well has produced approximately 160,000 bbl. of oil as of March 1, 1950, and its water-flood recovery to date has been 400 bbl. per acre-foot.

The Meryman lease is the largest lease in the field and was more completely drilled at the beginning of water flood. Fig. 4 shows the natural and water-flood performance of this lease.

Under natural production, this lease reached a maximum daily oil production of 720 bbl. in March 1938 and had declined to 140 bbl. at the beginning of water injection. The cumulative gross production was 756,400 or 191 bbl. per acre foot.

Under water flood, this lease reached a maximum daily oil production of 1,600 bbl. per day in February 1945 and is currently producing 150 bbl. oil per day. The gross cumulative water-flood oil as of March 1, 1950, was 1,472,800 or 377 bbl. per acre-foot. The water-flood recovery for the Meryman lease is

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slightly less than the field average.

The Boyd lease is located on the northwest edge of the field and was subject to an ineffective edge-water drive from the beginning. It was not as completely developed at the beginning of water flood as the Meryman lease. Fig. 5 shows the natural and water-flood performance of this lease.

The maximum daily oil production under natural conditions was 215 bbl. per day and under water flood was approximately 450 bbl. per day. The cumulative natural oil recovery was 227,402 bbl. or 182 bbl. per acre-foot. The cumulative water-flood recovery as of March 1, 1950, was 440,000 or 489 bbl. per acre foot.

Flood Performance, Total Field

The daily flood performance for the total field is shown in Fig. 6. The initial daily injection was approximately 2,000 bbl. and, with the completion of additional injection wells, the daily injection was increased to a maximum of 10,800 bbl. which is approximately the current rate.

The daily oil production was approximately 700 bbl. at the beginning of water injection in September 1943 and it increased to a maximum of 4,560 bbl. in July 1946. The production was maintained at near maximum during 1946 and since that time has declined to a current oil production of 800 bbl.

The daily water production was approximately 200 bbl. at the beginning of water injection and has gradually increased until the current water production is approximately 9,000 bbl. per day. The initial plant pressure was less than 40 psi. and this has been gradually increased until the present plant pressure is 500 psi.

The cumulative flood performance for the total field as of March 1, 1950, is shown in Fig. 7. The cumulative water injected was 16,300,000 bbl., the cumulative water-flood oil produced was 5,451,000 bbl., and the cumulative water produced was approximately 8,200,000 bbl. The cumulative ratio of water injected to flood oil produced was 2.9.

A small amount of water has been lost to outside properties but about an equal amount of water has been produced naturally from a few of the edge wells.

The natural and water-flood performance for the total field is shown in Fig. 8. The total field comprised 566 natural productive acres and 80 producing wells. A maximum natural daily oil production of 2,050 bbl. was reached in January 1938. By the end of 1944 the daily oil production rate had declined to approximately 700 bbl. and the gross cumulative oil production was 2,608,500 bbl.

It is estimated that, by the time the whole field was under flood, the total natural oil production was 2,800,000 bbl. The average natural oil recov-

ery was 4,950 bbl. per acre or 193 bbl. per acre-foot.

The total water-flood area comprises 527 acres and 81 producing wells. The total cumulative oil production, both natural and water flood, was 8,251,000 as of March 1, 1950. The cumulative water-flood oil recovery was 5,451,000 bbl., averaging 10,260 bbl. per acre or 391 bbl. per acre-foot.

It is predicted that the ultimate oil recovery, both natural and water flood, will be 9,200,000 bbl. of which 949,000 bbl. is yet to be produced. The ultimate recovery will be 17,100 bbl. per acre or 650 bbl. per acre-foot. The ultimate water-flood recovery will be 12,100 bbl. per acre or 460 bbl. per acre-foot.

Development and Operating Costs

The total development cost was approximately $1,400 per acre. This comparatively low cost can be attributed to several of the existing conditions, such as good mechanical conditions of wells and equipment, the availability of a cheap water supply, and to the fact that a lot of the early development had been completed with the thought of early water injection.

The operating costs at the beginning of flood operations were approximately $0.25 per gross barrel. Under flood, the cost decreased to a low of $0.11 per gross barrel, and then gradually increased until the current cost is approximately $0.90. The operating costs have been lower than average because of the exceptionally high unit recovery.

Under the present trend of operating costs, it is estimated that the economic limit for the operations will be reached when the production has declined to 300 bbl. per day. Plans are being made to convert the wells from pumping to flowing, thereby increasing the economic life.

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BOOKS

NORTH AMERICAN AND MIDDLE EAST OIL FIELDS. By W. A. VerWiebe, lithographed by Edwards Bros., Inc., Ann Arbor, Mich. Orders taken by W. A. VerWiebe, University of Wichita, Wichita, Kans. 259 pp. $6.

This is a revision of an earlier book, "Oil Fields in North America," by the same author, which has been one of the popular references for 20 years. It is lithographed on 8½ by 11-in. pages, which allows for larger-sized maps and illustrations. It contains new material on the following new topics: "Coral Reefs and Their Characteristics;" "Oil in Florida;" "The Golden Trend in Oklahoma;" "Cuyama Valley in California," and particularly a full account of the occurrence of oil and gas in the Middle East. It contains over 30 new maps. In revised, corrected, and amplified form, it covers, as did the earlier edition, the oil and gas areas in the United States, Mexico, Alaska, and Canada. The structure, stratigraphy, producing zones, oil traps, relation between structure and production, as well as other pertinent facts are presented. The drawings and the cross-sections show geographic distribution of pools, structural conditions, areal distribution of formations, facies changes, and thickness changes.

THE PETROLEUM CHEMICALS INDUSTRY. By Richard Frank Goldstein. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16. 449 pp. $8.50.

Although published originally in England, this book gives an impartial and objective account of the growth of the American petroleum-chemicals industry. It discusses its problems and possibilities, with special emphasis on the developments of the past 10 years. The author's primary objective is to survey the fields of industrial chemistry in which oil is the most economic starting material. Beginning with the source material of the petroleum-chemicals industry, he treats the chemistry of paraffins, the manufacture of olefins and other important classes of hydrocarbons, and the manufacture and reactions of the major petroleum chemicals. The book concludes with a discussion of the chemical byproducts of refinery operations and several related appendices.

CHEMICAL ENGINEERS' HANDBOOK. John H. Perry, editor. Published by McGraw-Hill Book Co., 330 West 42nd Street, New York 18. 1,184 pp. $15.

This new third edition provides a virtually complete revision of this standard chemical-engineering reference work, including a fresh and comprehensive coverage of both standard and recently compiled facts, figures, and methods applicable to both chemical engineering and its related fields. A group of more than 140 specialists have contributed detailed explanations of new developments in every branch of the industry. Several entirely new sections provide important information pertaining to furnaces and kilns, size enlargement, general theory on diffusional operations, and dialysis. More than 2,000 charts, diagrams, cross-sections, flow sheets, and other illustrations are included.

DOLLAR $AVER$

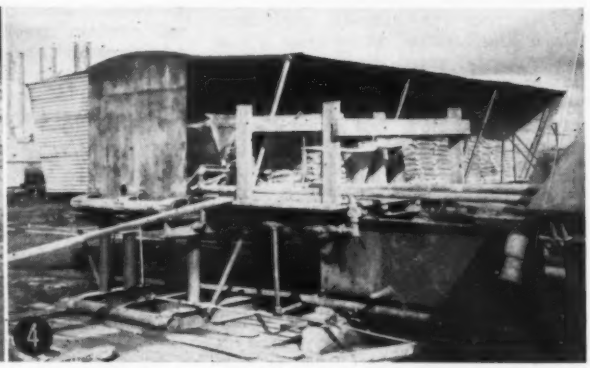
. . . IN DRILLING

Compiled by Leigh S. McCaslin, Jr.
Gulf Coast District Editor

1. PROTECTION TO DRILL PIPE. Wood buffers have been bolted to the top of these portable pipe racks which are in use on a Louisiana Gulf Coast rig. The buffers serve to protect the drill pipe from unnecessary wear.

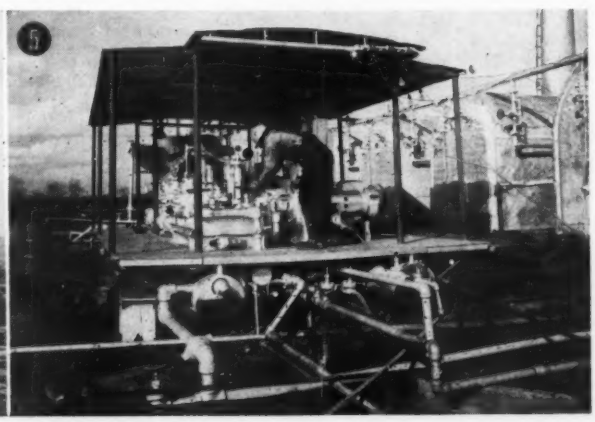
2. SUBSTRUCTURE ASSEMBLY. This collapsible and highly portable engine substructure is in use on a heavy steam rig drilling in the Louisiana Gulf Coast. Flooring is hinged to the upper part of the substructure on both sides. A collapsible roof held up by telescoping uprights is also connected to the substructure. To dismantle for a rig move, the engines are removed, the roof is telescoped down, and the flooring folded up against the side of the substructure.

3. PRIVATE FILLING STATION. This field-fabricated unit serves as a dispenser for kerosine and various types of oil in use on a Louisiana rig. The chain hoist is used to raise barrels containing the product to the top of the dispenser where they are emptied. The dispenser is divided into various compartments with a dispensing faucet at the bottom of each compartment. The entire unit is skid mounted for easy transport.



4. STORAGE.—This highly portable mud shed has folding floors and a folding roof. For a rig move, the roof is let down and the floors folded up to bring the shed to road width. It is skid mounted for easy loading.

5. BOILER FEED.—Boiler feed pumps have been mounted on a compact and portable unit on a Louisiana Gulf Coast rig. For a move, the braces supporting the two extensions of the roof are removed and the extensions dropped down. The extensions of the floor also fold down to bring the entire unit to road width.



XUM

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Heat Losses From Asphalt Tanks

What special papers have been written on heat losses from asphalt-storage tanks? We are particularly interested in the inside film conductance factors (F_i) used in:

$$U = \frac{1}{\frac{1}{F_i} + \frac{x}{K} + \frac{1}{F_o}}$$

W. B. H.

The troublesome point in estimating the inside film coefficient (F_i) and in fact the over-all coefficient (U) is the lack of knowledge about the velocity, circulation, or convection of the liquid asphalt. Undoubtedly, the rate of circulation or movement is very slow, but exact figures are not available. About all we can do is to look for somewhat similar situations. Scant information given in Petroleum Refinery Engineering, third edition, page 502 (McGraw-Hill Book Co., Inc., New York) shows that water tends to circulate at velocities of 0.2 to 0.5 ft. per second in small or laboratory-scale coil-in-box equipment and at 0.5-2.0 ft. per second in commercial equipment. Of course, water is much less viscous than asphalt at the probable tank temperature, and hence even lower velocities would be expected in asphalt tanks. Thus, the film coefficient (F_i) should be computed for the very low velocities of perhaps 0.05 to 0.2 ft. per second.

The rate of cooling of asphalt in tank cars is mentioned by David T. Day in his Handbook of the Petroleum Industry, Vol. 1, pages 814-815 (John Wiley & Sons, New York, 1922) and the results are shown on this page for the issue of July 29, 1948, page 283 (Cooling of Asphalt During Shipment). The tank-car temperature dropped from 243° to 154° F. in 2 days, and by 8 days had cooled to 100° F. Some data are also given on heating with steam. An analysis of this scant data would give an idea of the inside film coefficient.

The only other data that are readily available is the discussion published by the author of this page in The Refiner's Notebook No. 12 (The Oil and Gas Journal, October 7, 1944, pages 103-104) and reproduced in part on page 520 of the third edition of Petroleum Refinery Engineering. This article discusses the use of coils in tanks for purposes of heating or of maintaining temperature. A chart is shown for the heating of semisolid materials but it is specifically mentioned that it does not apply to asphalts or waxes.

In computing the rate of heating semisolid materials, over-all transfer rates of 5, 8, and 13 were used for differentials in temperature between oil and air of 50°, 100°, and 150° F., respectively. Obviously, the inside or oil film coefficient is substantially the same numerically as the over-all coefficient.

Lube Oil Additives Again

I note that the third edition of Petroleum Refinery Engineering does not contain much about the use of additives in lubricating oils. Any information you might have on how to obtain information on this topic will be deeply appreciated.—T. L. M.

The subject of lubricating-oil additives is so detailed that it can scarcely be handled on this page. Various phases of the topic have been discussed in the following issues of the Questions on Technology page in The Oil and Gas Journal.

1. March 27, 1941, page 208—Identification of Oil Additives.
2. September 4, 1941, page 60—References to Oil Additives.
3. July 30, 1942, page 168—Paratone and Other Oil Additives.
4. October 5, 1942, page 50—Additives for Increasing Viscosity Index.
5. November 18, 1943, page 49—Identification of Additives; also Launderometer Test for Diesel Oils.
6. December 30, 1944, page 267—Reducing Pour Point With Depressants.
7. April 7, 1945, page 97—Corrosive Tests for Gear Lubes, Their Significance.
8. March 16, 1946, page 115—References to Oil Additives.

Some of the articles that have appeared in the general literature since 1945 are:

9. Anon., Acryloid 150—Pour Point Improvers, The Oil and Gas Journal, April 20, 1946, page 142.
10. Anon., Lubricating-Oil Additives, Lubrication(The Texas Co.) January 1946.
11. Bland, Wm. F., Viscosity Index Improvers. . ., Pet. Processing, February 1950, page 139.
12. Boehm, A. B., Lubrication-Oil Improvers, The Oil and Gas Journal, November 11, 1948, page 335.
13. Calkins and White, Analyze Additive Lubricants . . . Spectrographic Methods Nat. Pet. News, July 31, 1946, p. R-519.
14. Denison and Condit, Oxidation of Lubricating Oils, Dialkyl Selenides as Inhibitors, Ind. Eng. Chem., 41, 1944 (1949).
15. Evans and Young, Polymers and Viscosity Index, Ind. Eng. Chem., 39, 1676 (1947).
16. Guthris, V. B., Value of "Heavy Duty" Motor Oils, Nat. Pet. News, December 19, 1945, page 52.
17. Hamilton and Keyser, Use of Chemical Additives in Petroleum Products, Nat. Pet. News, March 6, 1946, p. R-228.
18. Heiles and Croxton, Selenium Dioxide as a Lubricant Additive, Ind. Eng. Chem., 39, 1466 (1947).
19. Kalichevsky, V., Lubricating - Oil Additives—Oiliness Carriers, Pt. Refiner, August 1949, page 121.
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23. Matthews, F. L., Custom Building Lubricants With Additives, Pet. Refiner, March 1947, page 89.
24. McKee and Fritz, Stability Test for Additive-Treated Motor Oils, Anal. Chem., 21, 568 (1949).
25. Prutton and Musgrave, Modern Petroleum Lubricants, Chem. Eng. Progress, 45, 17 (1949).
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27. Thorpe and Larsen, Antiseizure Properties of Boundary Lubricants, Ind. Eng. Chem., 41, 938 (1949).
28. Van Horne, W. L., Polymethacrylates as Viscosity Index Improvers and Pour-Point Depressants, Ind. Eng. Chem., 41, 952 (1949).
29. Watkins, F. M., Action of Lube-Oil Detergents, Pet. Refiner, January 1946, page 89.
30. Zuidema, H. H., Bearing Corrosion (3 parts), The Oil and Gas Journal, February 16, 23, and March 2, 1946.
31. Zuidema, H. H., Dispersants in Lubricating Oils (3 parts), The Oil and Gas Journal, January 8, 15, and 22, 1948.

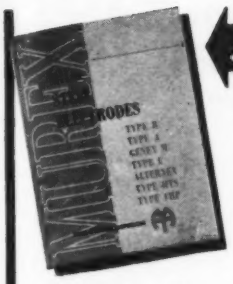
Does Polymerization Destroy Valuable Antiknock Hydrocarbons?

Note.—The octane numbers shown in the original Table 1 (Does Polymerization Destroy Valuable Antiknock Hydrocarbons, The Oil and Gas Journal, April 6, 1950, page 73) were incorrect and a corrected Table 1 is shown here. The octane numbers taken from the Frey et al article of The Oil and Gas Journal of September 2, 1948, page 61, were not those of the pure hydrocarbons, but of a 20 per cent solution in a 60-40 octane-heptane blend.

TABLE 1—OCTANE NUMBER OF HYDROCARBONS*

	Research		Motor	
	Oct. No.	Blending	Oct. No.	Blending
n-Butane	93.6	113	90.1	114
1-Butene	97.4	144	81.7	126
2-Butene (high boiling)	99.6	155	86.5	130
2-Butene (low boiling)	....	152	†99.0	128
Isobutane	‡0.17	122	97.6	121
Isobutylene	‡0.25	170	88.1	139
1,3-Butadiene	....	196	....	144

*Frey, Kerley, and Lovell, Knock Characteristics of 16 Pure Gaseous Hydrocarbons, The Oil and Gas Journal, September 2, 1948, p. 61. †Taken from page 179 of the third edition of Petroleum Refinery Engineering (McGraw-Hill Book Co., Inc., New York, 1949). ‡Equivalent ml. $PbEt_4$ in isooctane.



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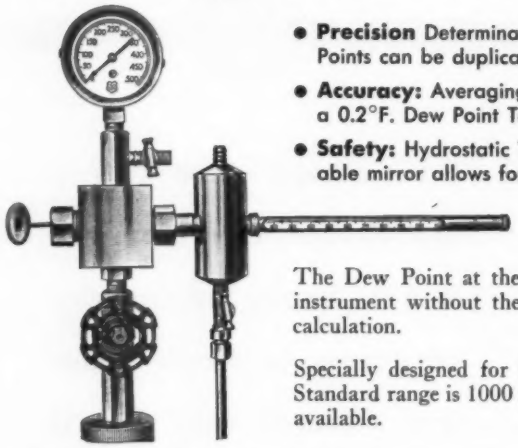

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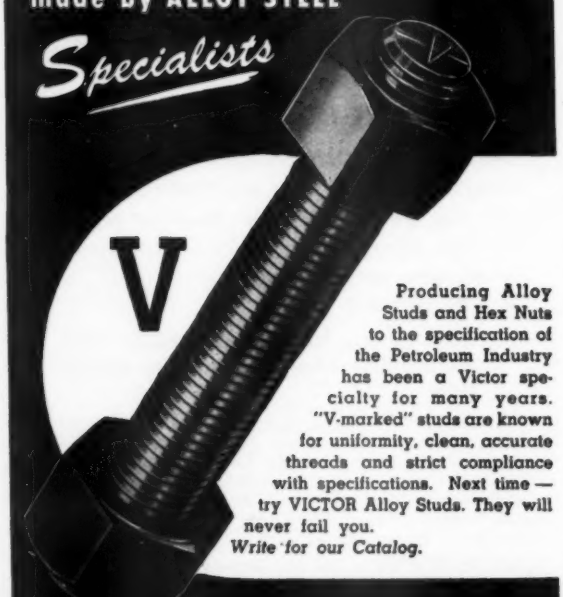

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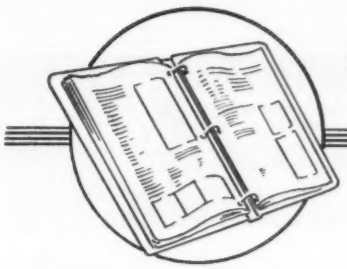

THE REFINER'S notebook

Control-Valve Flow Rates

SELECTION of the proper control valve requires specification of certain items, among which are included: (1) Air-to-open (reverse-acting) or air-to-close (direct-acting), (2) Fluid handled, (3) Valve material, (4) Operating temperature, (5) Specific gravity or specific volume of fluid at operating temperature, (6) Allowable pressure drop through valve at design flow rate, (7) Maximum flow rate, (8) Minimum flow rate (in certain cases), and (9) Type of inner valve.

Maximum Flow Rate

As noted, determination of items (7) and (8) is apt to prove most difficult. Once maximum flow rate and design pressure drop have been established, selection of nominal valve size through manufacturer's charts or tables is largely a routine matter. The valve flow coefficient C_v (and hence nominal valve size) determined on the basis of maximum flow rate is therefore the maximum C_v (valve wide open) and has the same numerical value for a given valve whether passing liquid, vapor, or gas.

The generally stated practice in sizing a control valve is to select a nominal valve size one or more sizes smaller than the line size. This is in accordance with the basic concept of the control valve as a variable orifice in the line. Another general rule is to establish the normal flow for the process, then size the valve to pass twice this "normal" flow when wide open. The first problem is to establish the normal process flow which in an existing installation may be done on the basis of hourly or daily variations and for a new installation on the basis of past experience. Obviously the experience factor and sound judgment are extremely important here.

A design flow rate for the valve of double the normal process flow rate is often considered to be the upper limit and the control valve may be sized to pass about one and one-half times the "normal" or "normal maximum" process flow when wide open. Accordingly, when lacking more specific information, the general rule is to size the valve to pass normal process flow at say 60 to 75 per cent of maximum flow through the valve.

Fractionator System

Some general comments as to selection of control valves and determination of valve capacity on a specific installation can be made by referring to a typical fractionator system ()Fig. 1).

1. Control valve on feed line—should be reverse-acting or air-to-open (opens wider on increase of air pressure on the diaphragm). This is also termed a "normally closed" or "spring closing" valve since it will close on air failure. Minimum flow or leakage through the control valve as a general rule would not be critical here.

2. Valve controlling condenser water—should be direct acting (increase in air pressure tends to close the valve) or normally open since it will stay open on air failure. Sized on basis of water flow. Leakage not critical.

3. Valve on overhead accumulator vent line. Minimum flow rate may be important. In sizing note worst water conditions to condenser which results in maximum amount of non-condensibles.

4. Valves on reflux and net overhead product lines — direct-acting (air-to-close). Leakage not critical in either of these applications. (Block valves may be installed to obtain positive shutoff when necessary). In general, a control valve on a pump discharge may be sized to handle maximum pump capacity with valve wide open. On level-control application size to pass twice normal flow from reflux drum.

5. Steam to reboiler — should close on air failure. Minimum flow rate not important. Size valve on basis of steam flow.

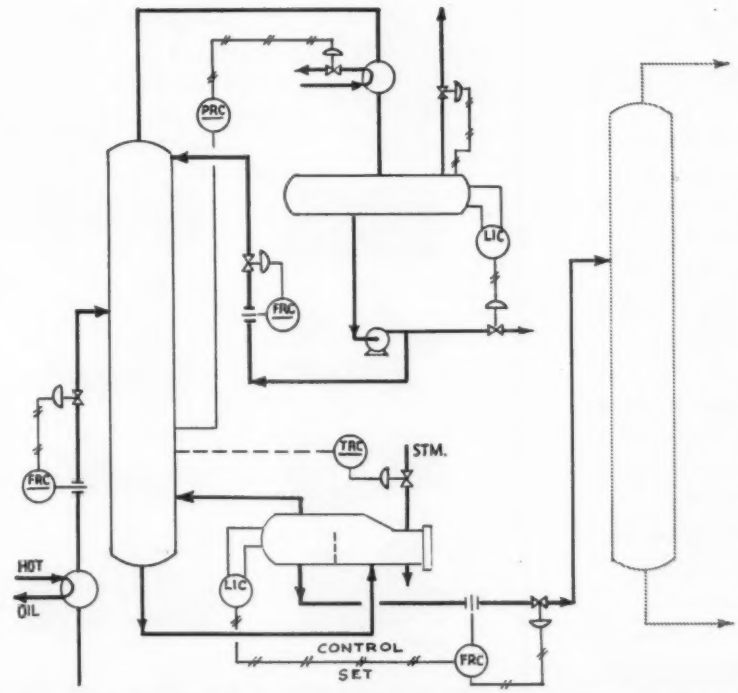

Fig. 1—Location of control valves in fractionator system. Both columns under pressure.

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Permeability Distribution Arrangements

THE "normal distribution" of permeability variations throughout a reservoir system was discussed in previous units of this series. It is convenient at times to show these variations in different forms. The present discussion will present one such arrangement.

A normal-frequency-distribution curve is shown in Fig. 1 by the dotted line. These same data can be plotted as a total cumulative frequency, thus giving the solid line of Fig. 1. The solid line is in effect a plot of the area under the dotted curve up to a given point on the x axis, or the dotted curve is a plot of the slope of the solid curve. The frequencies shown on the dotted curve can be added cumulatively from the right or left. In this particular instance they were added from the left.

Figs. 2 and 3 are histograms of permeability (distribution curves on a stepwise basis using number of samples as frequency) shown also converted to a cumulative frequency basis. These conversions were made simply by adding the individual steps of the histograms from left to right. Representing the permeability data in this fashion has the effect of averaging the distribution curve. If slopes were taken from the solid cumulative curves, their plot would be a smoothing of the histogram into a continuous function.

Fig. 4 is another permeability plot of this type based upon 82 samples from a given horizon. Here permeability is plotted versus the cumulative number of samples having a permeability below that particular value. If these data were from a system where the permeability followed a normal distribution the curve would be similar to that shown in Fig. 1. These data actually show on an average basis a continuously increasing frequency so that the slopes would decrease continually. This would indicate a permeability distribution continually decreasing from zero permeability. Actually, it appears that these data can be grouped in several intervals, each interval being a separate distribution curve similar to that of Fig. 1. The observation is perhaps made clearer by noting one of these intervals plotted on an expanded scale to show the variations in slope. The formation from which these samples were taken might well be regarded, therefore, as being made up of four distinct intervals which one average distribution curve will not suffice to describe. It might be noted that these 82 samples were from many wells in a single reservoir.

These considerations indicate the possibility of utilizing such a statistical approach to the permeability and porosity data of a reservoir in attempting to break down an interval into distinct zones.

Fig. 2—(Below, center) Permeability variation as frequency distribution and as cumulative frequency. (Reference 1).

Fig. 3—(Below, right) Permeability variation as frequency distribution and as cumulative frequency. (Reference 2).

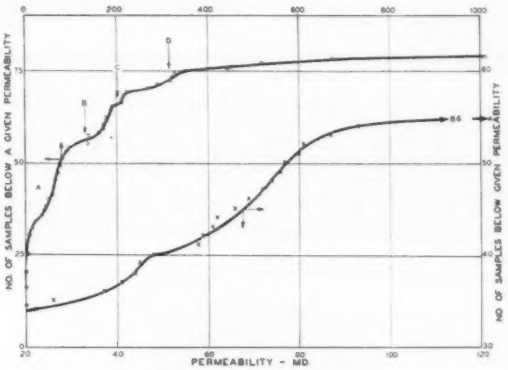
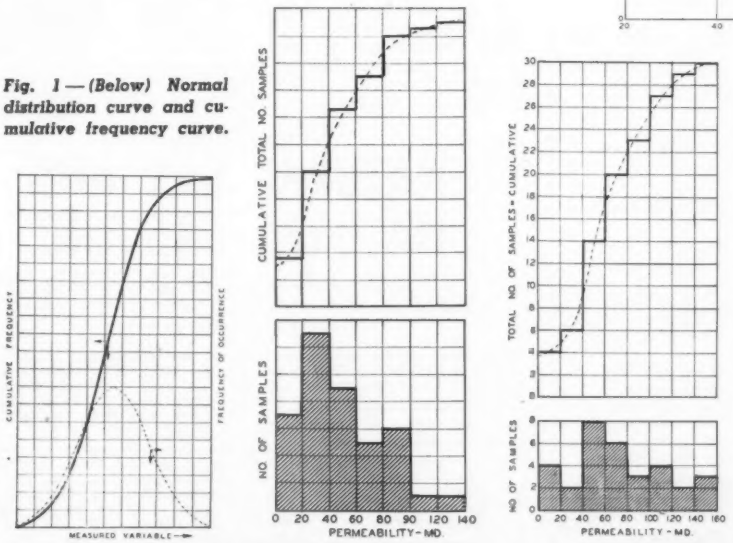


Fig. 4—(Above) Cumulative frequency curve showing possible distribution intervals. (Arrows indicate breaks between separate cumulative frequency curves. Reference 3).

Fig. 1 — (Below) Normal distribution curve and cumulative frequency curve.



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1. U.S.B.M., R.I. 3715, page 84.
2. U.S.B.M., R.I. 4019, page 30.
3. Frank Folger, Masters Thesis, University of Oklahoma, 1949.

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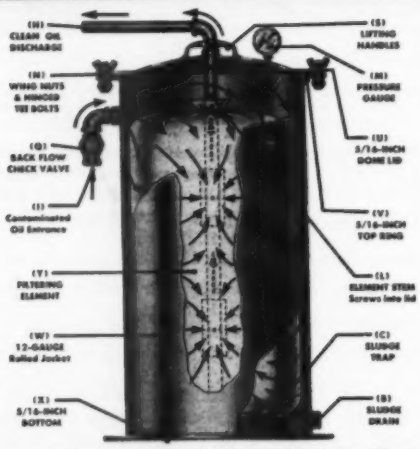
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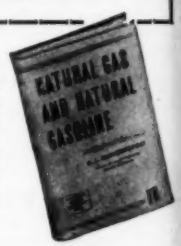

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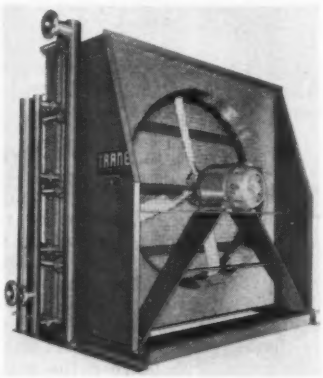

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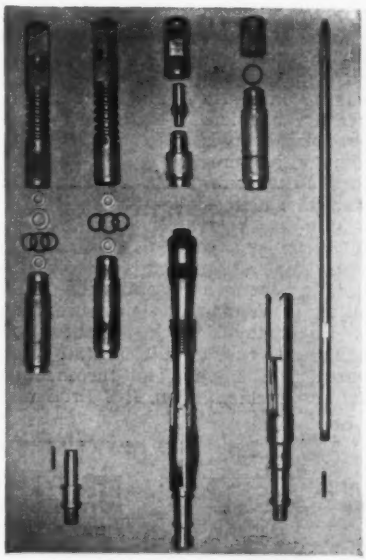

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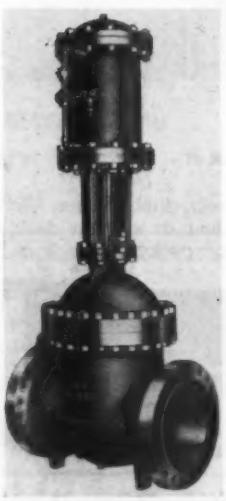
long and weighs 2 oz., yet it offers full six-power magnification and a field of view of 315 ft. at 1,000 yd. It has an optical system of six coated lenses that gives full correction for spherical and color aberration. *Pan-technics, Ltd.*

IT'S NEW CHECK IT

27 WAFER-TYPE VALVE is designed to resist torque. Vane, shaft assembly, handwheel control with self-locking worm and gear, and flareout on body casting which accommodates the large mounting bracket, are identical with double-flanged valve. In open position the beveled streamlined vanes create a venturi action. Pressure drop is low and it therefore shows substantial savings in pumping power. There are no pockets to capture sediment, no change of flow direction to create turbulence. This valve designated as No. 771, is used for air, gas, liquids, steam, and semisolids in the shutoff and regulation of volume and pressure; pressure relief; control of liquid level, back pressure, water hammer, steam hammer, constant differential pressure; regulation of pump, fan, engine, and turbine output, and control of automatic combustion. *R-S Products Corp.*

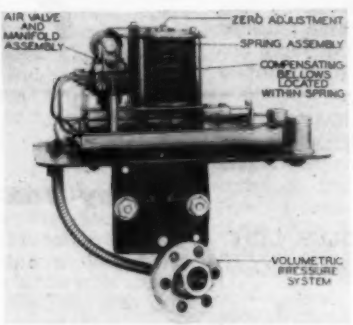
IT'S NEW CHECK IT



28 CYLINDER-OPERATED PIPE-LINE VALVE features a reciprocating piston and cylinder mechanism. Operation is controlled by a four-way valve, mounted on piping leading to the cylinder. This control valve admits pressure below piston to open large valve, and by a quarter turn, reverses fluid to area above piston for closing the large valve. Air, gas, oil, or water may be used to operate the mechanism. To avoid accidental closing of main valve caused by fluctuations in line pressure, the upper cylinder head is equipped with a stem-holding safety device, which holds the valve in the open position until pressure is applied above the piston. *Kerotest Manufacturing Co.*

IT'S NEW CHECK IT

29 TRANSAIRE PRESSURE TRANSMITTER was developed, as a companion to the Taylor Transaire temperature transmitter, to offer convenience and accuracy of suppressed range at high pressure levels. The pressure transmitter makes it possible to measure and transmit up to 1,000 ft., the smallest of pressure changes with an accuracy of ½ per cent of the range span. A few of the instrument's outstanding features are: narrow range spans of 20 to 40 psi. over range limits of 35 to 415 psi. with sensitivity of .1 per cent or .02 or .04 psi., depending on range span used. Regardless of the pressure range or span, the output of the transmitter is always linear from 3 to 15 psig. eliminating necessity for individual calibration of matching receivers or receiver-controllers. Operating ranges can be varied with range limits by a single screw-driver adjustment. Range limits can be shifted when operating conditions change or it is necessary to transfer the instrument from one application to another. *Taylor Instrument Cos.*

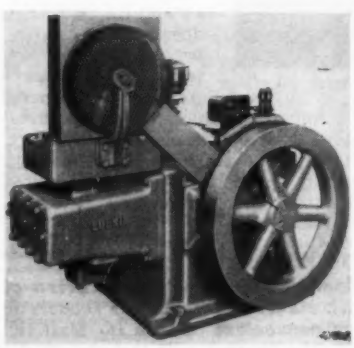


IT'S NEW CHECK IT

30 RIG RUNNER automatically records on a strip chart all drilling operations by relating them to the various positions of the traveling block. Time required for trips, number of stands, down time, drilling rate, and other information is recorded accurately. A few notes and comments written directly on the chart will provide a comprehensive drilling report. Each chart roll is sufficient for more than 2 weeks of continuous operation, but the chart can be torn off daily if desired without losing the continuity of the record. The time of any event on the chart can be determined to within a fraction of a minute. A low-pitched warning notifies the driller of routine operations, as for example, when the third tool joint passes through the rotary on trips out of the hole. A high-pitched horn signals the entire crew when the block approaches dangerously close to the crown. *Warren Automatic Tool Co.*

IT'S NEW CHECK IT

31 LUFKIN H-333 ENGINE. Designed specifically for oil-field use, the Lufkin H-333 horizontal engine is a two-cycle, two-cylinder, medium-speed, crosshead-construction engine. It has a speed range of 350 to 750 r.p.m. with a continuous horsepower rating of 20 at 425 r.p.m. and 30 at 650 r.p.m. The bore is 5½ in. diameter and the stroke is 7 in. Total displacement is 333 cu. in. This engine is the first two-cycle oil-field engine to be equipped with an electric starter, and offers a combination gas-gasoline carburetor so that engine can be started easily on gasoline when natural gas is not available. *Lufkin Foundry & Machine Co.*



Baash-Ross News

BAASH-ROSS TOOL COMPANY • LOS ANGELES • HOUSTON • OKLAHOMA CITY • NEW YORK

OUR 30th YEAR

Hex Kellys Give the Most in PERFORMANCE FEATURES

...and BAASH-ROSS GIVES THE MOST IN HEX KELLYS!

The Hexagon Kelly has become firmly established among performance-minded oil men as the *best* all-around kelly for modern drilling operations. It is not only easier to keep straight, is stronger, has greater circulation area, and incorporates many other important features (as highlighted at right) . . . but, in addition, it can be used for *both* regular and pressure drilling operations without change. This added feature greatly simplifies equipment inventories and also saves vital time when pressure emergencies occur — both advantages of utmost importance!

And Baash-Ross is the organization that, from the very beginning, has consistently led in the development of the Hexagon Kelly . . . in the development of better metallurgical and heat treating processes for incorporating the best *balance* of physical properties into Baash-Ross Hexagon Kellys . . . in the development of better machining techniques to assure a straighter bore, better joint alignment, more uniform wall thickness and other advantages in *Baash-Ross* Hexagon Kellys.

Result — when you combine the natural advantages of Hexagon Kellys with the *added* advantages of Baash-Ross manufacturing and control techniques you get a new standard of kelly performance when you specify *Baash-Ross Hexagon Kellys!*

These are the NATURAL ADVANTAGES of Hexagon Kellys...

- **SMOOTHER RUNNING** — because they are *machined* — not forged — to shape, hence have closer tolerances, better balance!
- **GREATER RESISTANCE TO BENDING** — because even across their weaker axis they are 17½% more resistant to bending than the comparable size square kelly across its stronger axis!
- **36% MORE CIRCULATION AREA** — because of greater cross-sectional area. Particularly vital with today's full-hole pipe and high-volume pumps!
- **24% STRONGER IN TORQUE** — because of their shape and greater cross-section. Doubly important with today's longer strings, higher rotational speeds!
- **GREATER TENSIONAL STRENGTH** — because of more cross-section. A valuable feature with today's heavier strings!
- **MAXIMUM ADAPTABILITY** — because they can be used for *both* regular and pressure drilling *without* change. Simplifies inventories, saves vital time in pressure emergencies!

These are the ADDED ADVANTAGES You Get in BAASH-ROSS Hexagon Kellys!

- **BEST BALANCE** of shock-resisting *toughness* and wear-resisting *hardness* resulting from the exclusive Baash-Ross method of subjecting specially-selected alloy steels to multiple *full-length* heat-treatments that develop the metallurgical properties of the steel for both hardness and toughness.
- **UNUSUALLY ACCURATE BORE,** exactly centered end-to-end and then individually checked by special survey equipment.
- **PRECISE JOINT ALIGNMENT,** double-checked by the Baash-Ross Alignoscope, assures concentric rotation and freedom from joint failures.
- **PLUS EQUALLY RIGID CHECKS** on overall straightness . . . on thread form, taper, lead and finish . . . on dimensional accuracy of drive faces, upsets, etc. . . . checks that meet all API specifications as well as extremely close Baash-Ross specifications.

The ideal teammate for Baash-Ross Hex Kellys . . .

the BAASH-ROSS HEX ROLLER KELLY BUSHING

All the advantages of roller bushing performance—plus vital quick-adjustment feature!

When you adopt Hex Kelly equipment, be sure to get the utmost in Hex Kelly performance by driving your kellys with a Baash-Ross Hex Roller Kelly Bushing—*the Bushing especially designed for use with hexagon kellys!*

Not only does this Bushing provide all the well-known advantages of Baash-Ross Roller Kelly Bushings . . . instant friction-free response to bit feed, better control of weight, more footage per bit, longer equipment life and higher all-around drilling efficiencies . . . *but it also permits quick adjustment to provide the close fit so essential for maximum Hex Kelly performance.*

The narrower driving faces on Hex Kellys make it vitally important that a close fit be maintained between the Bushing and Kelly at all times.

In the Baash-Ross Kelly Bushing this adjustment is readily made by simply adding or removing Adjusting Shims in the body. Each set of Shims added or removed changes the working diameter by exactly 1/32", making close adjustment a quick, simple operation. (See page 416 of your 1950 Composite Catalog for further details on this vital adjustment feature!)

FOR: • Greater Footage per Bit • Greater Freedom from Twist-Offs • Smoother, Faster Drilling • Longer Kelly and Equipment Life

standardize on Baash-Ross Hexagon Kellys driven by Baash-Ross Hex Roller Kelly Bushings . . . *the perfect combination for maximum drilling efficiency!*

BAASH-ROSS KELLYS ARE AVAILABLE THROUGH LEADING [illegible]

XUM

32 SRB TYPE "JH" OIL AND GAS SEPARATOR HORIZONTAL OIL VALVE is interchangeable in the line with the usual type of separator oil valve. It can be furnished with either the series 15 or the series 30 flange and in pressure ratings up to 500 psi. It can be completely dismantled without removing the body from the line. The component parts of the valve consist of a body, cap, cage, A.P.I. ball and seat with adapter, stainless-steel plunger, and the necessary lever work or diaphragm for operating the valve. All sealing is accomplished by "O" rings, three of which are used for sealing the plunger and one for sealing the cap. Valve body, which is flanged for 2-in. pipe sizes, can be equipped with 1¾, 2¼, or 2¾-in. A.P.I. ball and seat by using the proper cage and adapter. *S.R.B. Co.*

IT'S NEW CHECK IT

33 TYPE B KELLY DRIVE BUSHING. The body is of solid one-piece construction. An oil-resistant inner cushion fits the corrugated bore of the body to absorb shock and assure a silent drive as the kelly rotates. A slip retaining ring provides a positive lock and quick method of changing the kelly bushing to fit all square kelly sizes from 3 to 6 in. inclusive. A unique feature is the grease-packed body. The bushing incorporates two kelly wipers, one at top and one at bottom, which retains the grease within the bushing, providing constant lubrication between the kelly and liner surfaces at all times. These kelly wipers also prevent all foreign matter from entering the bushing. Liners are available in either steel or aluminum bronze. Takes all sizes of slips, liners, and wipers necessary to fit square kellys. *Byron Jackson Co.*

IT'S NEW CHECK IT

34 PORTABLE ELECTRIC GREASE GUN is a streamlined machine, 23 in. high, 27½ in. long, mounted on rubber tires and weighing about 230 lb. Twenty-five pounds of grease of any weight, from the heaviest fiberous to the lightest, will flow freely through a pressurized tank, even under low temperatures. A modified Ford starter motor develops up to 5 hp. on the pump through a series of gears running in oil. A thumbscrew adjusts a maximum grease pressure, from 500 to 12,000 psi. A metering hand nozzle available on this gun can be adjusted to pass a tiny drop, or the largest shot of grease, then stop until the trigger is pulled again. *Brown Grease Gun Co.*

IT'S NEW CHECK IT

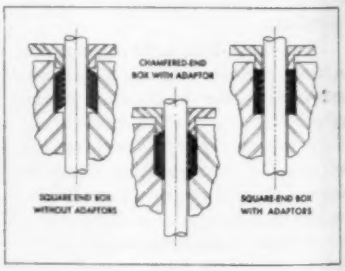
35 MASTER SUPREME SET consists of 15 double hexagon sockets ranging in size from 7/16 to 1¼ in., a 10-in. ratchet, 18-in. nut spinner, 15-in. sliding bar, 18¾-in. speeder, universal joint, and 3½, 5, and 10-in. extension bars. Sockets feature a lock groove in each of the four sides of the drive hole to grip the friction ball on the square drive of the handle. Wrench openings are hot-broached to give clean, strong side walls, and broaching chips are curled in the bottom to present smooth interiors. Numbers and sizes are stamped clearly on each socket for easy size identification. The ratchet has a 32-tooth action, and only a 12° handle swing is necessary for operation in restricted areas. Pawl engages two teeth of the gear at all times, thus furnishing a smooth action and additional strength. *Snap-on Tools Corp.*

IT'S NEW CHECK IT

36 RUNNING HOURS METER. Accurate, totally enclosed, dustproof, this electrical recorder indicates total and current operating hours on separate counters. Meter operates in any position. Consumes 4 watts of 115-volt, 60-cycle power. Requires 3½ by 3½-in. panel space. Weighs 18 oz. Each counter registers to 9999.9 hours in 6-minute increments. Knurled knob resets running hours. High torque, synchronous motor is lubricated for life. Electrical terminals are on meter back. *Special Products Division, Phillips Petroleum Co.*

IT'S NEW CHECK IT

37 CONE-TYPE TEFLON PACKING is for use in stuffing boxes where the application demands complete resistance to chemical attack and where the packing must allow a freely operating spindle. It cannot be attacked by any chemical, nor can it contaminate any material. Also, the natural slipperiness of Teflon makes it ideal for packing purposes. Teflon withstands temperatures from 150° to 550° F. It is supplied as a series of cone-shaped rings. Low gland pressure exerts a flattening action forcing the cone-shaped segments to bear outward against the stuffing box and inward against the spindle with sufficient pressure to maintain a seal, yet create minimum friction. It is supplied in sets to meet specified requirements, and is available with adaptors for either square-end or chamfered-end stuffing boxes. *United States Gasket Co.*



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PRESSURE CONTROLS
Available for numerous industrial applications. They are equipped with Bourdon tubes and have outside double adjustments which eliminate guesswork when setting controls. Indicators show the operating range on the calibrated dial.

REMOTE STEM TEMPERATURE CONTROLS
For control of liquids or gases, such as air, oil, water, paraffin, glue or distillate vapors and many other industrial applications. A heavy gauge Bourdon tube is employed which is actuated by the expansion of volatile liquid within the remote bulb. The control is equipped with convenient outside double adjustments.

LEVER ARM AND FLOAT CONTROLS
Mercoid lever arm controls have a variety of applications where it is desired to mechanically open and close electric circuits Mercoid float controls are used for maintaining fluid levels in tanks or for control of sump pumps or cellar drainers.

LINE VOLTAGE THERMOSTAT
The No. 855 thermostat is used for line voltage applications where it is desired to handle the full motor load directly without the use of a relay. Available with "on-off" manual switch for unit heater applications. These thermostats are used for both heating and refrigeration applications.

TRANSFORMER-RELAYS
Type V is a reliable low voltage mercury contact relay which also acts as a transformer inducing low voltage (24 volts) on the pilot circuit. There is no hum or chatter. Used for all types of automatic equipment. Available in various voltages, cycles and circuits.

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Galvo-Paks, Dowell's packaged magnesium anodes,* simplify the installation of cathodic protection systems for pipelines, tanks and other buried metal structures. Their use eliminates the costly, troublesome practice of mixing bulk backfill, insures proper placement of the anode in the backfill, and gives maximum performance.

Galvo-Paks are Dowell magnesium anodes packed with a specially prepared, quick-wetting backfill material in cloth sacks. On the job, Galvo-Paks are simply dropped into augured holes. The bag within a bag insures proper centering of the anode.

Galvo-Pak is a product of Dowell, a subsidiary of The Dow Chemical Company,

*Patented and patents pending.

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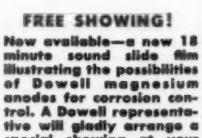

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MAGNESIUM ANODES FOR CORROSION CONTROL

PIPE LINES

Mileage Report

Gas lines exceed train trackage, survey shows

NEW YORK.—There are now more miles of natural-gas transmission line than there are railroads in this country, Gas Appliance Manufacturers Association, Inc., reported last week.

A survey compiled from information made available by the Federal Power Commission shows systems now in operation and lines authorized by FPC during 1949 aggregate 266,930 miles. This compares with 227,744 miles of railroad track in the United States.

During the 4½-year period ended January 1, 39,213 miles of natural-gas transmission lines were authorized, or were pending authorization. Total authorized during the same period was 26,513 miles, costing $1,682,000,000, including the Big and Little Inch lines which were converted from oil to gas transmission. Of that total, 13,757 miles were completed by January 1, 1950, and lines totaling 12,700 miles were still pending authorization by the federal commission.

Including the distribution systems of gas-utility companies, the total mileage in natural-gas lines in this country, in place and authorized, amounts to 346,400 miles, according to the G.A.M.A. survey. Steel requirements for natural-gas pipe lines approved and pending approval during the above period totaled 7,798,700 tons. That total does not include the Big and Little Big Inch lines. They and numerous short lines are included, steel requirements total 8,765,000 tons.

"Despite the fact that 1948 and 1949 established new records in Federal Power Commission authorizations of natural-gas pipe lines," states the survey, "applications pending before the commission on February 1 provide for an aggregate increase of 4,700,000,000 cu. ft. of natural gas a day. During 1949 the commission authorized construction including 7,537 miles of new pipe lines, costing $600,000,000 to bring new gas facilities or to augment supply to more than 100 cities of over 50,000 population and to increase the available supply by 3,000,000,000 cu. ft. daily.

The principal impact now is and will continue to be along the Eastern Seaboard, with every major city from Maine to Florida eventually receiving natural gas. In addition to the influx of natural gas to Eastern cities, H. Leigh Whitelaw, managing director of G.A.M.A., predicted that the Pacific Northwest would in a few years be receiving natural gas from Canada to expand the total of states so served to 44 or 45. He added that the three big lines now serving the Northeast had projected plans for delivering a total of 1 billion cubic feet daily to that major consumer area.

On receipt of natural gas late this year, New York City companies do not plan to alter their B.t.u. content to consumers. The natural gas will replace gas currently manufactured from oil. Some utilities in the Northeast will convert to straight natural gas and many will follow some program of increasing B.t.u. in mixed gas.

Phillips Plans New Line

BARTLESVILLE, Okla. — Phillips Pipe Line Co., wholly owned subsidiary of Phillips Petroleum Co., has announced plans for a 281-mile, 10-in. crude-oil pipe line from Borger, in Hutchinson County, Texas Panhandle, to Yale, in Payne County, Oklahoma.

The line, according to K. S. Adams, president of the parent company, will make it possible for Phillips Pipe Line Co. to transport West Texas and Panhandle crude to the Phillips Petroleum Co. refineries at Kansas City, Kans., and Okmulgee, Okla. The line will fill in a gap between the existing 12-in. line from Odessa, Tex., to Borger, and the present 8-in. line from Yale to Kansas City.

No contracts have been let for the proposed line, and construction is not expected to get under way for several months, Adams said.

Texas Panhandle field production will supplement the refineries' crude supply, received chiefly from Oklahoma and Kansas fields at the present time.

P. G. & E. Line Progresses

SAN FRANCISCO.—Work is now in progress between Barstow and Mojave, Calif., on Pacific Gas & Electric Co.'s 506-mile, 34-in. natural-gas line from Topock, Ariz., to Milpitas, Calif., Bechtel-Price-Conyes, contractor, reported last week.

Double-ending plant is in operation at Barstow, with R. L. Bowman, general superintendent, in charge, and M. V. Scott, manager of the mainline office at Barstow. Steve Valline is serving as manager of the project office in San Francisco.

Bechtel also reported that work is now in progress on Interprovincial Pipe Line Co.'s 441-mile, 20-in. crude-oil line from Edmonton, Alta., to Regina, Sask. Canadian Bechtel, Ltd.,

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Write for Literature

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and Fred Mannix & Co. have contract.

In the Bechtel Somastic Division, work is being done on 10 miles of P. G. & E.'s 34-in. line near Tehachapi, Calif., with Lloyd Hampton as superintendent. Also included in the division's work is the coating of 13 miles of 6-in. and 50 miles of 10-in. for Richfield Oil Corp. in the Cuyama Valley of California, which will start this month.

Gas-Gathering System

WICHITA FALLS. — Construction of 118 miles of 3 to 26-in. gas-gathering system for Phillips Petroleum Co. in Sherman and Hansford counties, Texas, is about 60 per cent complete, Vaughn & Taylor Construction Co., Inc., contractor, reported recently.

Two spreads are now at work, under direction of D. D. Vaughn and Jess Moore. Field office is located at Texhoma, Okla.

The company will begin construction soon on 27 miles of 10¾-in. line for Colorado-Wyoming Gas Co., Denver. The line will run from Mesa Station to Boulder Junction, Colo., and spread will be under direction of D. D. Vaughn.

Mid-Valley Section

TULSA.—O. R. Burden Construction Corp., contractor on a 63-mile, 20-in. section of Mid-Valley Pipe Line Co.'s Texas-to-Ohio crude-oil line, reported last week that work is expected to be completed on its portion by August 1. The company is laying the 20-in. from Longview to Dixie, La.

Also expected to be completed around August 1 is a 42-mile, 16-in. section of Texas Empire Pipe Line Co. crude-oil line, from Wilmington, Ill., to South Gary, Ind.

Little Big Inch Trouble

SOMERSET, Ohio. — A section of Texas Eastern Transmission Corp.'s Little Big Inch natural-gas pipe line blew out near here last week, and although no one was injured, escaping gas created a fire hazard.

A 40-ft. stretch of the 20-in. line was ripped and a crater 25 ft. deep was caused by the blowout. The line runs from Houston to Linden, N. J., and parallels the 24-in. Big Inch line along most of the route.

Algonquin Hearing Set

WASHINGTON.—Federal Power Commission has scheduled a hearing on Algonquin Gas Transmission Co.'s application to construct a 254-mile main line and 364 miles of laterals in New England to begin as soon as is practicable following hearings now being held in Boston on the compet-

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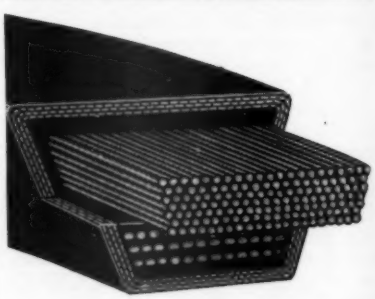

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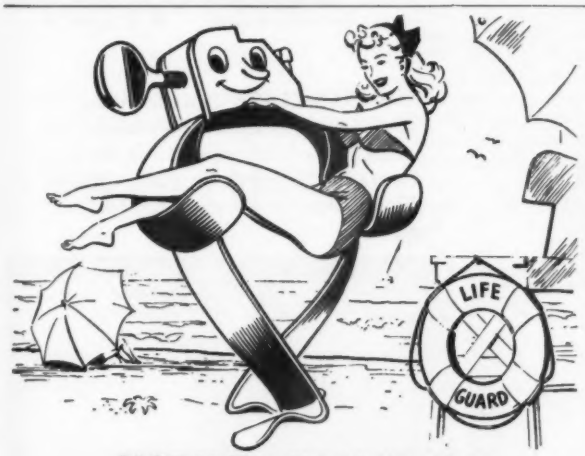

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NEWS

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ing application of Northeastern Gas Transmission Co.

Northeastern also is seeking authority to construct a natural-gas system in New England, including 545 miles of line.

Algonquin had requested that matters relating to its market requirements be set for hearing in Boston immediately following or in conjunction with the Northeastern hearing.

In its motion, Algonquin said that Northeastern's proposed facilities comprise a project which is in competition with and directly opposed to the Algonquin plan. The motion pointed out that certain gas-distributing companies have signed gas-purchase contracts with Algonquin or Northeastern only, and a large number of distributing companies have signed letters of intent with both Algonquin and Northeastern to enter into contracts for the purchase of natural gas. Algonquin contended that a full and complete record of the New England area's natural-gas requirements can't be made without the participation and supporting evidence of the customers proposed to be served by it as well as those proposed to be served by Northeastern.

The Algonquin project, estimated to cost $33,217,090, would have an initial delivery capacity of about 260,000,000 cu. ft. per day. The proposed transmission system would include a main 254-mile line extending from a point of connection with Texas Eastern Transmission Corp.'s facilities near Lambertville, N. J., to a point in the Boston area; approximately 364 miles of laterals, and a compressor station near Middletown, Conn.

Northeastern Gas Transmission Co.'s proposed New England project would include 545 miles of line and is estimated to cost $22,350,000. The Northeastern system would have an initial capacity of about 285,000,000 cu. ft. per day, which would be supplied by Tennessee Gas Transmission Co. and Transcontinental Gas Pipe Line Corp. Northeastern proposes to receive gas from Transcontinental at a connection on the New York-Connecticut boundary near Greenwich, Conn., and from Tennessee at the New York-Massachusetts boundary near Pittsfield.

Ohio Plans New Line

CHEYENNE, Wyo.—Ohio Oil Co. has asked Wyoming Public Service Commission for permission to construct a new 12-in. crude-oil line from its Byron pump station about 15 miles northwest of Stanolind Station in Elk Basin field, at a cost of approximately $550,000.

The company now has a 6-in. line from the Byron-Garland fields into Frannie, and joining with Interstate Oil Pipe Line Co.'s line into Billings. It does not have a connection on the north end of the basin with Service Pipe Line Co., however.

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Crose Internal Lineup Clamps are available in manual, electric and hydraulic models for pipe sizes ranging from 12" to 36". Crose Internal Lineup Clamps have been proven in world-wide field operations.

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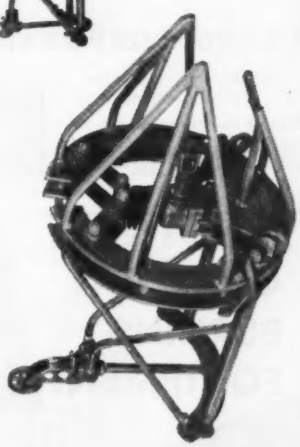

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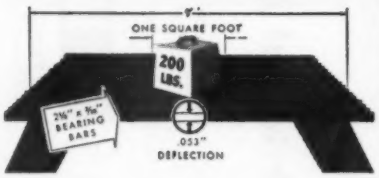

The locked-in strength of Tri-Lok enables it to stand up under heavy loads—even on long spans. No rivets, bolts, or welds are used in the construction of Tri-Lok; this feature eliminates the possibility of loose joints.

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REFINING

Plant Nearing Completion

TORONTO. — British-American Oil Co., Ltd., is nearing completion on its new $400,000 propane deasphalting unit at the lubricating-oil plant at the Clarkson refinery near here. The new unit will be used for production of new bright-stock lines not formerly manufactured at the plant.

At a celebration to be held May 26, British-American Oil Co., Ltd., will dedicate its newly expanded Montreal East refinery. C. D. Howe, minister of trade and commerce for Canada, will be the chief speaker, addressing over 400 guests invited to inspect the recently completed units.

New units, which include crude distillation, propane decarbonizing, fluid catalytic cracking, and power facilities, went on stream late last year.

May Expand Refinery

NEW YORK. — Paul G. Blazer, chairman of the board of Ashland Oil & Refining Co., stated that his company, which recently purchased Frontier Oil Refining Co. of Buffalo, is considering expansion of the Frontier 10,000-bbl. refinery near Buffalo.

Frontier will continue to market products under its own trade name through independent jobbers, he said, although trade names of the Ashland organization will be made available to any independents who request them.

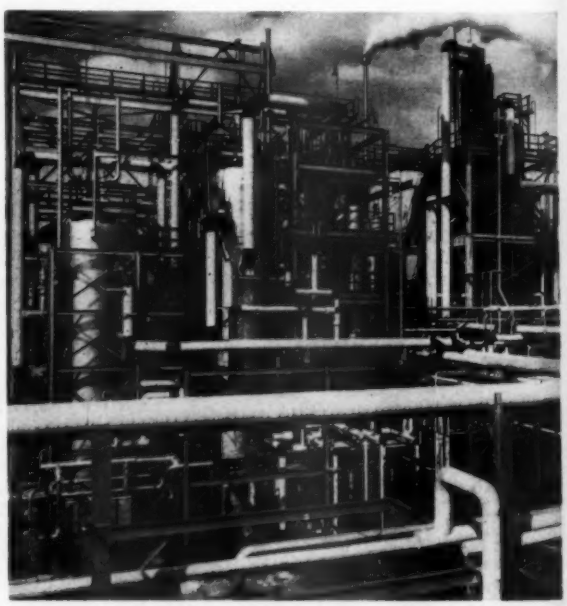
Expansion of the Buffalo plant hinges on the availability of crude. Blazer denied reports that his company planned to construct a pipe line to Buffalo. He stated that the possible future availability of Canadian crude at that Lake Erie port might change the picture in that area.

Blazer further denied current reports that Ashland would associate with California Oil Co., an eastern affiliate of Standard Oil Co. of California, saying in his opinion Ashland could earn more as an independent than as part of any major oil company.

Crude Receipts Up

WASHINGTON.—Total receipts of crude oil at refineries in the United States averaged 5,360,000 bbl. daily in March, compared with 5,279,000 bbl. daily in February and 5,356,000 bbl. daily in the same month last year, according to monthly data released by the U. S. Bureau of Mines.

However, there has been a decided change in receipts by origin. Domes-



***M.E.K. PLANT.** — Dedication of this 7,500 bbl. per day M.E.K. solvent dewaxing unit last week marked the completion of a general modernization program at Esso Standard Oil Co.'s Bayonne, N. J., refinery. The new solvent unit employing methyl ethyl ketone, benzol and toluol, will produce lubricating oils, and 178,000,000 lb. of wax annually which represents nearly 25 per cent of the estimated national production of petroleum wax for 1950. The new plant supplants the manual method of wax making, which utilized chilling and separation in plate or frame presses. Modernization at Bayonne also included installation of a new boiler house and two boilers with steam producing capacity for 400,000 lb. per hour. The 75-year-old Bayonne refinery, Esso's oldest and one of the first plants on the East Coast, is a specialties plant. It operates in conjunction with the company's nearby Bayway refinery at Linden, N. J., and produces wax, lubricating oils, and asphalt. Contractor for the M.E.K. unit was E. B. Badger & Sons Co.*

tic crude, received at refineries in March, averaged 4,893,000 bbl. daily, or 105,000 bbl. daily less than in March 1949. On the other hand, foreign crude moved to refineries at the rate of 467,000 bbl. daily compared with 358,000 bbl. daily in the same month last year.

Refinery runs in March were 5,336,000 bbl. daily, representing an increase of 20,000 bbl. daily over the average for February but a decrease of 16,000 bbl. daily from March of last year.

Penn Grade Meeting

OIL CITY, Pa.—Plans are being prepared for the twenty-seventh annual meeting of the Pennsylvania Grade Crude Oil Association in Pittsburgh, June 15.

W. C. Wenzel, executive manager, announced that Dr. James Boyd, director of the U. S. Bureau of Mines, Washington, D. C., will address the luncheon session on petroleum research. The group will meet in the William Penn Hotel.

At the morning session, following election of directors, H. G. Botset, University of Pittsburgh School of Petroleum Engineering, will discuss the status of secondary-recovery research in the Pennsylvania Grade crude-oil region. He is technical adviser on the Association's production research program.

Dr. M. R. Fenske, director of the petroleum-refining laboratory, Pennsylvania State College, will examine the quality outlook for Pennsylvania oils in the second scheduled address of the morning.

Afternoon speakers will include Andrew Heiskell, publisher of Life magazine, and Breck P. McAllister, attorney with the New York City law firm of Donovan, Leisure, Newton, Lumbard & Irvine. The association's board of directors will meet Friday, June 16, at 10:30 a.m. in the hotel and elect officers. C. E. Streeter of Bradford, Pa., is completing a year as president.

Lube Production Rises

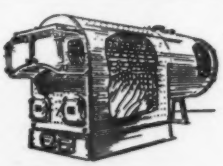
TULSA.—Production of lubricating oils in the Mid-Continent area totaled 1,380,438 bbl. during March, an increase of 252,575 bbl. or 22.4 per cent over the same month last year, Western Petroleum Refiners Association reported.

The report was compiled from 14 reporting companies. The comparison figures, however, are based on 13 reporting companies.

Shipments rose sharply during the month, but stocks on hand fell below the level set that time last year. Shipments, both domestic and export, amounted to 1,500,602 bbl., up 370,367 bbl. or 32.8 per cent. Domestic shipments totaled 1,393,031 bbl., a gain of 332,821 bbl., or 31.4 per cent, and exports were up 37,546 bbl., or 53.6 per cent, to 107,571 bbl.

Stocks on hand at the end of March totaled 1,638,226 bbl., 6.4 per cent, or 111,174 bbl. below the same month last year.

Supply on hand at the end of March was 83 days, compared with 123 days a year ago.



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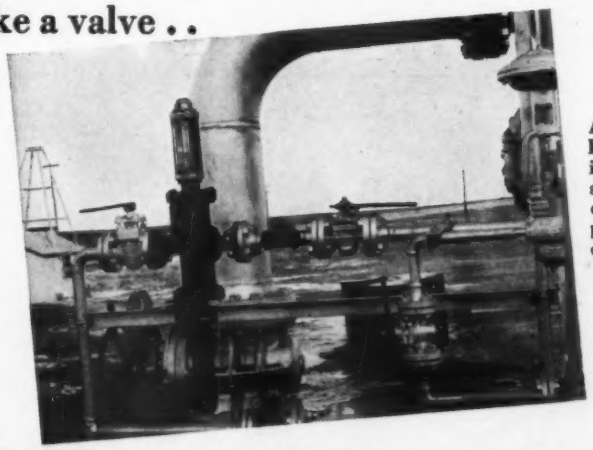

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- Suitable for all industrial pressures, temperatures
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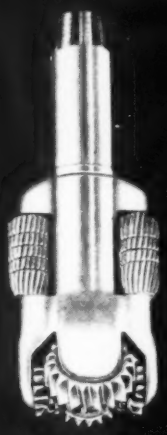

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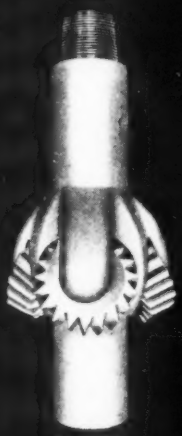
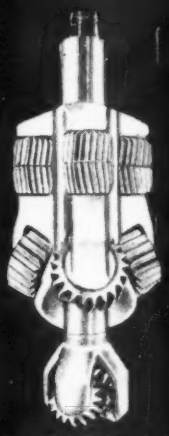


3-POINT
HOLE OPENER



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WITH ROCK BIT PILOT

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Among the Drilling Contractors

Committeemen Appointed For Kansas Contractors

WICHITA.—Appointment of committee members for the Kansas chapter of the American Association of Oilwell Drilling Contractors for the ensuing year has been announced by C. H. Todd, R. W. Rine Drilling Co., Wichita, recently elected chairman of the chapter. Committees and their members are:

Program: Heber Beardmore, Jr., Beardmore Drilling Co., Wichita, chairman; F. M. Stevenson, Signal Oilfield Service Co., Great Bend; and Chester Williams, Flournoy & Williams, Wichita.

Membership: J. D. Adkins, Adkins Drilling Co., Great Bend, chairman; W. S. Brunson, Brunson Drilling Co., Wichita; and John M. Little, Jayhawk Drilling Co., Wichita.

Publicity: W. J. Coppinger, Coppinger & Southern, Wichita, chairman; Fred Stickle, Stickle Drilling Co., Great Bend; and Thomas M. McCall, Quaker Drilling Co., Wichita.

Transportation Study: C. L. Roberts, B. & R. Drilling Co., Russell, chairman; A. R. Peters, Powell & Peters Drilling Co., Great Bend; and E. R. Sloyer, R. W. Rine Drilling Co., Wichita.

Sam L. Tennant Drilling Co., Blackwell, Okla., is the contractor on a wildcat test which L. G. Squires is starting at 1 John Otto, NW NW SW 23-27n-2e, 1¼ miles southwest of Kildare, east central Kay County, Oklahoma.

Day-tour crew on a rig which Hondo Drilling Co., Midland, currently is running for Skelly Oil Co. in Scurry County, Texas. Bottom row, left to right: Hubert Nelms (driller), L. W. Tucker and R. M. Bagley. Top row, same order: R. E. Chandler and Tom King.

B & R Drills in Nebraska

B & R Drilling Co., Wichita, is moving a rig into Harlan County, Nebraska, just across the line from Phillips County, Kansas, where it, with Alpine Oil & Royalty Co. as joint operator, will drill 1 Fischer SW SW SE 33-1n-18w. The location is about 5½ miles north and slightly east of the Huffstutter pool, Phillips County, Kansas, the northernmost production on the Central Kansas uplift trend of pools.

New Drilling Company

Luther Gregory, formerly with Cox Drilling Co., Owensboro, Ky., has organized his own contracting company and will operate in the Illinois, Indiana and western Kentucky area. The new company, G & L Drilling Co., will have its main office at Princeton, Ind.

Delta Drilling Co., Tyler, Tex., has the contract for a 7,700-ft. Travis Peak exploratory which The Texas Co. is starting in the William Howeth Survey, 2 miles southwest of Pine Hill, Rusk County, East Texas.

Stearns Drilling Co., Russell, Kans., has contracts for two wildcat tests to be drilled for Courtney B. Davis in southeastern Osborne County, on the west side of the Salina Basin, northern Kansas. The projected tests are 1 Cooper, NW NE NW 29-10-11, and 1 Applegate, NE SW SW 11-10-12. The former is about 25 miles northeast of nearest production, the Fairport pool, Russell County. The other is 5 miles further northeast.

Pegg Brothers Drilling Co., San Antonio, has a rig on a wildcat location in Edmund C. Durst Survey 13, on the Adams ranch, 14 miles north of Hondo, Medina County, Southwest Texas, where it is drilling for C. E. Smeltz.

Hubbell & Webb, Stroud, Okla., contractors for Creekmore-Rooney Co. and associates on the lately completed Prue sand discovery well, 1 James, NE NE SE 32-14n-6e, about 9 miles southwest of Stroud, Lincoln County, Oklahoma, is starting a second test in the area for the same operators. The new test, 1 Bracksieck, NW NW SW

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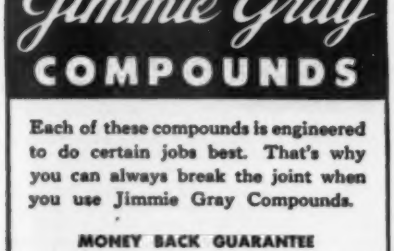

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33-14n-6e, is an east offset to the discovery well, which produces from a total depth of 3,113 ft.

Bankhead Drilling Co., Baton Rouge, has the contract to drill William Helis 1-A Helis-Karsten Unit 2, a projected 8,400-ft. test in the University field, adjoining Baton Rouge, East Baton Rouge Parish, Coastal Louisiana. Location is in 65-17s-1w.

Milton Crow, Inc., Shreveport, has contracted with Tex Harvey Oil Co. to drill a 6,000-ft. wildcat test at 1 Coker, 3-18s-27w, 3 miles south of Fouke, Miller County, Arkansas.

Al Buchanan Drilling Co., San Antonio, is starting a 12,000-ft. test for Gravis & Mitchell at 1-E Ponchartrain, 7-9s-2e, St. Gabriel field, Iberville Parish, southern Louisiana.

Work-Over, Inc., Houston, will drill a 13,000-ft. test in the Valentine field, Lafourche Parish, Coastal Louisiana, for Pan American Production Co. The test, 2 Peltier, is in 11-17s-20e.

Moutray-Rankin Drilling Co., Davis Okla., has contracted with Vickers Petroleum Co. to drill a 4,700-ft. test at an outpost location northwest of the South Palacine field, Stephens County, Oklahoma. Location is in 11-2s-7w.

Peterson Drilling Co., New Orleans, as contractor and joint operator with Sohio Petroleum Co., is starting a 6,000-ft. wildcat test, 1 Senseman, in 20-14n-7e, 3 miles west of Winnsboro, Franklin Parish, Louisiana.

Owen Drilling Co., Overton, Tex., is rigging up to drill another test for Union Producing Co. and M. H. Marr in the Big Island field, Rapides Parish, Louisiana. The test, 2 Crooks, 41-5n-3e, is projected to 5,700 ft.

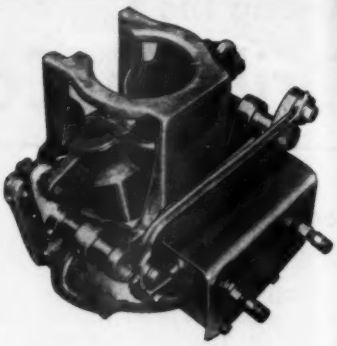
Marine Well Service Co. has the contract for another Gulf Refining Co. well in the Bayou Couba field, St. Charles Parish, Louisiana. It will be 39 Delta with location in 13-15s-21e. Hole will be carried to 7,600 ft.

ROTARY RIGS IN OPERATION*

(United States and Western Canada)

Area—	Week ended 5-15-50	Change week ended 5-8-50	Change week ended 5-16-49
Gulf Coast	482	— 9	— 64
W. Tex.-N. Mex.	726	— 3	+168
Ark.-N. La.-E. Tex.	140	+ 5	— 9
Oklahoma	261	— 6	— 2
Kansas	138	+ 8	+ 17
Illinois-Eastern	129	+ 3	+ 2
Rocky Mountains	60	—11	— 52
Pacific Coast	120	— 3	— 78
Total United States	2,056	—16	— 18
Western Canada	55	— 2	— 22
Total	2,111	—18	— 40

*Courtesy Hughes Tool Co.



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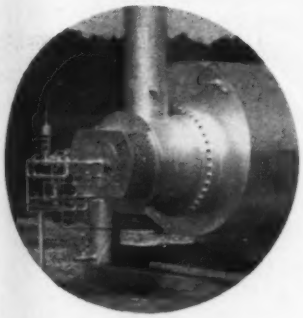

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3. **Tube, coils and immersed choke (adjustable or fixed) easily and quickly removed, when necessary.**
4. **Available in six standard BTU output capacities: 200,000; 450,000; 650,000; 900,000; 1,100,000 and 1,350,000 BTU.**
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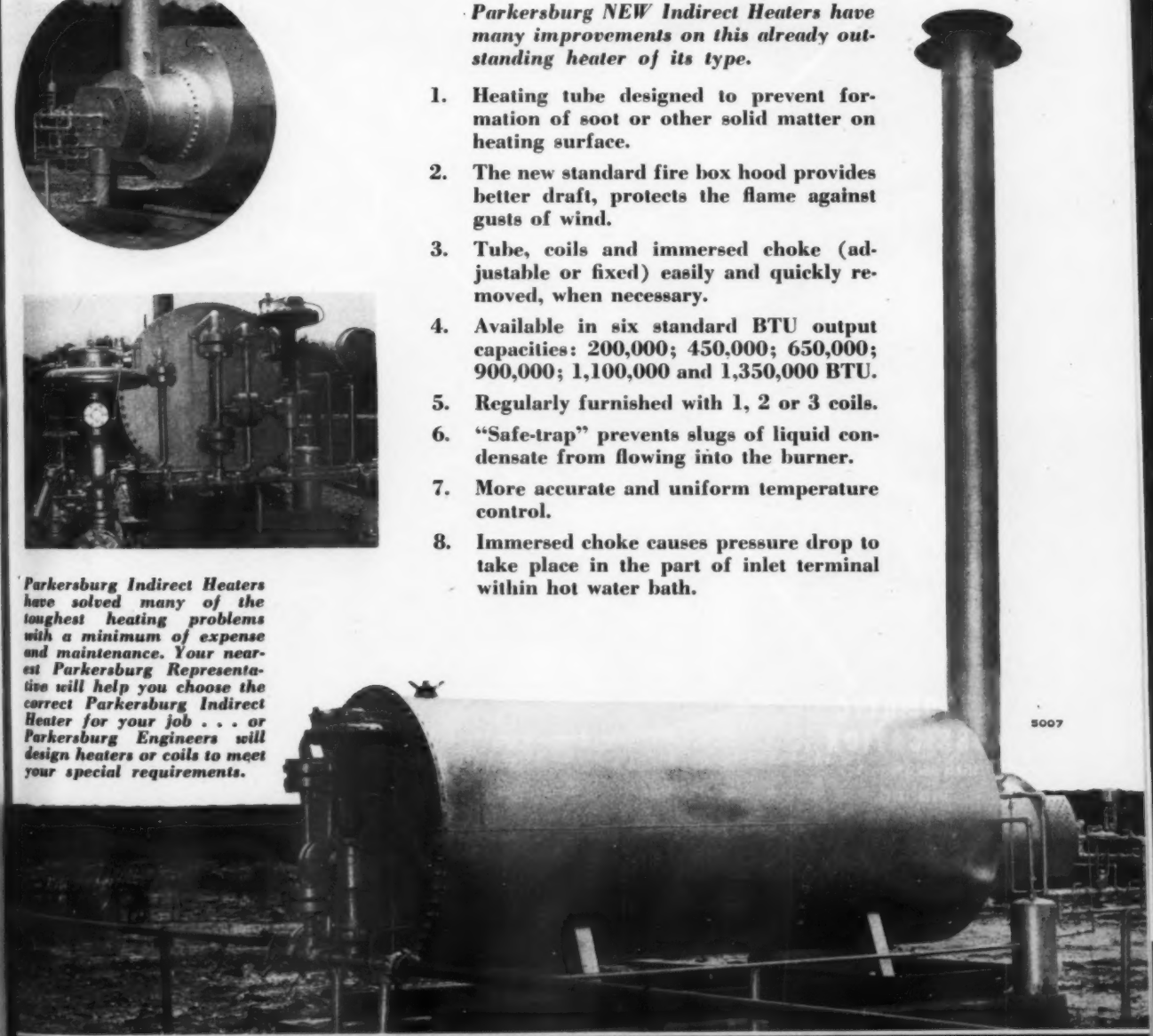

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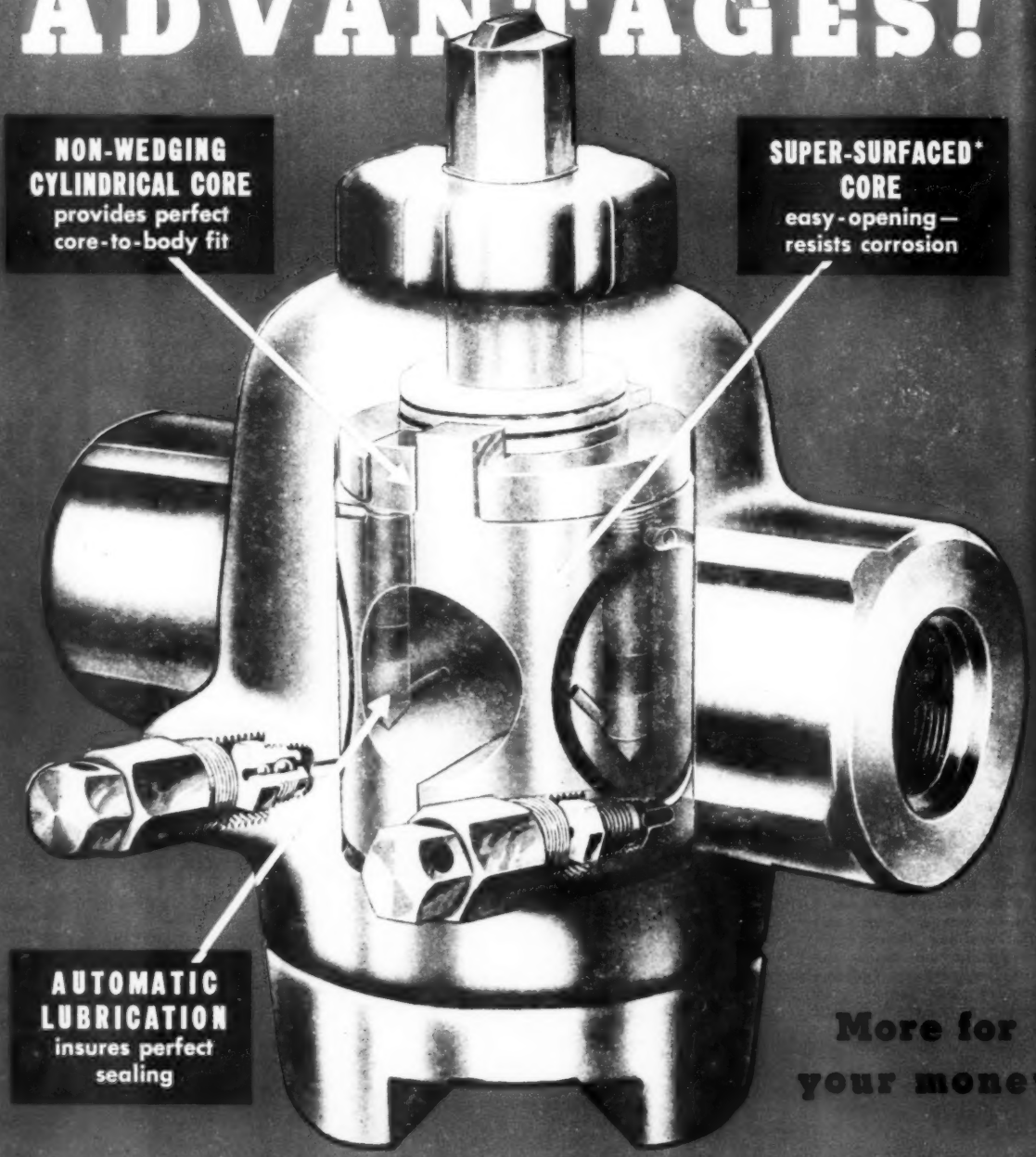

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NATURAL GAS

Storage Plan

Two firms propose underground facilities

NEW YORK.—Texas Eastern Transmission Corp. and New York State Natural Gas Corp. have applied to the Federal Power Commission for permission to acquire, develop, and operate an underground-storage field in western Pennsylvania that will ultimately provide each firm with daily delivery capacity from the field of 200,000,000 cu. ft. during the five winter months of each year.

The additional gas available to Texas Eastern east of the storage field will be used to meet the winter peak loads of Algonquin Gas Transmission Corp. for its proposed New England market and of other customers of the company's Big Inch system, Texas Eastern announced.

Peoples Natural Gas Co. announced at the same time that it has contracted to transfer to New York State Natural and Texas Eastern certain oil and gas leaseholds and underground gas-storage rights in western Pennsylvania with some wells and pipe lines.

The gas available to New York State Natural will be sold by it to Peoples Natural Gas Co. and East Ohio Gas Co. to meet the winter demands of the customers of those companies, the application stated. Both Peoples and New York State Natural are subsidiaries of Consolidated Natural Gas Co.

The new storage field is designed to hold ultimately a total of 105 billion cubic feet of gas under the joint arrangement. Forty-five billion cubic feet will be base or cushion gas, and the remaining 60 billion cubic feet will be available, 30 billion to each company (Texas Eastern and New York State Natural) during the 5 winter months.

Mississippi Fuel Proposal

WASHINGTON.—Mississippi River Fuel Corp., St. Louis, has filed a second amended application with Federal Power Commission in connection with its plan to increase daily sales capacity of its natural-gas transmission system from 266,000,000 to 375,000,000 cu. ft. Hearing on the application opened here May 24.

Under plans set forth in the second amended application, the company would install compressor units totaling 28,380 hp. in seven new stations, and additions totaling 4,100 hp. in two previously authorized stations. In addition, Mississippi River Fuel would build a 40-mile, 20-in. line from a point near Dubach, La., to its Perryville, La., compressor station, and 0.7 miles of 24-in. line and four 12-in. lines in a crossing of the Mississippi River in the metropolitan St. Louis area.

Sales Up in March

NEW YORK.—The American Gas Association reported last week that total sales of gas by utilities to ultimate customers during March was 4,215,314,000 therms, an increase of 27.9 per cent over the 3,295,609,000 therms sold during that month last year.

For the 12 months ended March 31, total sales of gas amounted to 37,249,292,000 therms, a gain of 12.3 per cent compared with 33,181,032,000 therms sold in the same period the year previous.

Natural-gas sales totaled 3,928,027,000 therms in March, an increase of 29.8 per cent over that month last year. A total of 33,845,029,000 therms was sold for the 12-month period ended March 31, up 13.7 per cent over the same period a year ago.

Bid for Line Dismissed

WASHINGTON.—Application of Jersey Central Power & Light Co., Asbury Park, N. J., proposing construction of a 7-mile natural-gas line in New Jersey has been dismissed by the Federal Power Commission for lack of jurisdiction.

The proposed line would extend from a point on Jersey Central's existing system near Old Bridge, N. J., to a power plant in the borough of Sayreville in Middlesex County.

Propose Accounts Reform

WASHINGTON.—The Federal Power Commission has issued a notice of proposed rule making which would amend its Uniform System of Accounts for natural-gas companies to incorporate changes indicated by important developments in the natural-gas industry since its adoption in 1939, and by experience gained over the past 10 years.

The proposed changes include provision of accounting for inventories of gas stored underground and account classifications for storage plant and expenses; relocation and better accounting for products extraction operations; and relocation from production expenses of credits for gas used by the utility.

The commission said that the need for making these changes also affords the opportunity for making a number of other changes designed to improve the plant and expense classifications of the System of Accounts.

Natural Gasoline

L.P.G. as Motor Fuel

CHICAGO.—Liquefied petroleum gas as a motor fuel may hold the key to solving the present fluctuation between winter and summer demand in that industry, members of the Liquefied Petroleum Gas Association were told at their recent annual meeting and trade show at the Palmer House here.

Increased applications in industrial and chemical operations and expanded farm use were also seen as sources of possible relief from the problem. It was emphasized, however, that while winter and summer demand is decidedly out of balance in most areas, the seasons of peak consumption vary in different areas of the country.

Development of new summer time or year-round use for L.P.G. products is one of the major topics confronting industry representatives, and use of the product as a motor fuel for city bus lines, large motor freight fleets, and farm tractors is considered the best outlet for increased usage.

The association laid plans for an intensive advertising campaign, and stressed the importance of getting additional sales by rendering good service.

Hydrogen Sulfide Study

AUSTIN.—Dr. W. A. Cunningham, chemical-engineering professor of the University of Texas, has completed a study of hydrogen sulfide reserves in the Permian basin of West Texas and New Mexico, and current output of the substance as a petroleum by-product.

Most of the 40 natural-gasoline plants now operating in the basin are stripping hydrogen sulfide from their commercial fuel gas and burning the surplus compound in scrubbing-plant fires, Cunningham said.

There is a possibility, he said, that the basin's hydrogen sulfide may be converted into something of higher value than sulfur.

"If that happens it will compensate for the higher transportation costs."

Assuming an operation at 60 per cent of capacity, Cunningham reported, 26 of the 40 plants are processing 1.25 billion cubic feet of gas daily.

"This gas contains hydrogen sulfide equivalent to more than 500 long tons of sulfur. Gasoline plants proposed or now under construction will increase that estimate 25 per cent."

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Permian Basin Sets Dizzy Pace

JUST 4 weeks ago The Oil and Gas Journal published a special section on the Permian basin, complete with a map. Throughout the various articles there was a constant theme that the future looked just as promising as the past; that there was a lot of oil still to be discovered in this region.

Almost as though that issue had been a challenge, the operators have since brought in a string of important new strikes at a pace that leaves the average observer slightly breathless. Without attempting to rate them for their long-range significance, but as they look now, here are some of the key successes.

In central east Hockley County, about 4 miles south of Smyer, a new Pennsylvanian reef discovery by Honolulu Oil Corp. and Signal Oil & Gas Co. looks like an excellent producer and a confirmation of a trend of reef oil projected generally north-northwest from Borden County. The well, the 1-13 M. D. Underwood, is located 510 ft. from the north and east lines of Labor 13, League 5, Wilbarger County School Land Survey, and some 12 to 15 miles east of the east edge of Slaughter field, a big Permian producer.

This well looks good for about 2,000 bbl. per day of 41°-gravity oil from reef pay at 9,290-9,320 ft. The reef top is called at —5,896 ft., which puts it about 150 ft. higher than the reef in the same operators' dry hole 1-24 Ellwood Estate, which was dry in the Ellenburger at 11,633 ft. total depth.

Originally some geologists called this reef Canyon; now many are thinking in terms of Cisco, which lies just above the Canyon. Other geologists point out that strictly speaking, a reef is an anomalous stratigraphic condition intruding in a geological section. Therefore whether it is called Strawn, Canyon, or Cisco (from older to younger), is apt to confuse the thinking about regional reef trends. The same reef trend, depending on its up or down-dip location in the contemporaneous regional geological basin, may have an oil-bearing top section, whether technically labeled Strawn, Canyon, or Cisco. Unless the geologist is careful in his thinking, he may mistake one broad regional reef trend for two or three separate sets of reefing conditions.

In southeast Lynn County, about 14 miles east of O'Donnell, in Section 431, Block 9, EL&RR Survey, Magnolia Petroleum Co. 1 Garza Land County, found 41°-gravity oil in drill-stem test in a Pennsylvanian lime (reef?) at 8,615-30 ft., flowing 14 bbl. of oil in 1 hour. Top of pay is at —5,695 ft. This strike lies east of the main reef trend as figured by some geologists, and will either force revision of some theories on trends, or open up ideas about another line of reefing.

Then last, but certainly not least, Chaves County, New Mexico, claims a share of the spotlight with a new discovery in the Roswell (?) basin, that basin lying north of the westward trend of the Central Basin platform, west of the Texas line, and mostly east of the Pecos River. Magnolia Petroleum Co. 1 Lightcap Land Co., SE SE 6-8s-30e, about 35 miles northeast of Roswell, flowed 146 bbl. of 52°-gravity oil in 2 hours 15 minutes from Devonian lime pay at 7,940-78 ft., gas-oil ratio 1,527 cu. ft. From an elevation of 4,078 ft., top of the Devonian is called at —3,877 ft.

The nearest Devonian oil is in Bagley field of northwest Lea County, roughly 35 miles southeast of the new strike. This basin has shown signs of being particularly good hunting ground ever since Mid-Continent Petroleum Co. started the play with the opening of Crossroads pool.

Back in the Borden-Scurry-Kent county area that has been in the limelight for so long, there were as usual, several developments that in quieter weeks would have made headlines. Summed up they indicate that there is a tremendous amount of oil in that trend and that water-oil contact levels can vary substantially in not too great distances, so that wells that look pretty low can make very good producers in some spots. Also that good oil is apt to be found in some of the shallower sands that come up over the oil-bearing parts of the reef.

It is pretty obvious by now that reefs bear much study, and that the levels at which oil accumulations may be found cannot be figured as simply as in regular structural accumulations.

Charles J. Deegan.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

WEST TEXAS.—In Scurry County, Esperado Mining Co. 1 McDonald, 336-97-H&TC, extended production 1 mile north of the Kelley sector of Kelley-Snyder field, with a flow of 150 bbl. of oil an hour from open hole at 6,775-6,936 ft. The well kicked off without swabbing, following a 4,000-gal. acid treatment. In Martin County, The Texas Co. 1-X State, which previously had flowing production from the Devonian, recovered 4,000 ft. of oil and no water on a drill-stem test at 13,110-13,331 ft. in the Ellenburger.

SOUTHEAST NEW MEXICO.—Magnolia Petroleum Co. 1 Lightcap, Devonian discovery 30 miles northwest of Bagley field, was flowing at the rate of 22 bbl. of oil an hour on potential test. Top on the Devonian was corrected to 7,955 ft., from 7,970 ft.

ALABAMA.—Humble Oil & Refining Co. is waiting on pumping equipment to be installed at the 1 Marion Davies, et al., Clarke County wildcat. The well will be completed through perforations at 5,419-29 ft. This interval was drill-stem tested, using 1-in. top and ⅜-in. bottom chokes, and recovery was 400 ft. of mud and 4,800 ft. of mud-cut oil. Gravity of the oil has changed several times, and correct gravity is not yet known. If completed as a commercial producer, this will make the second field discovery for the state.

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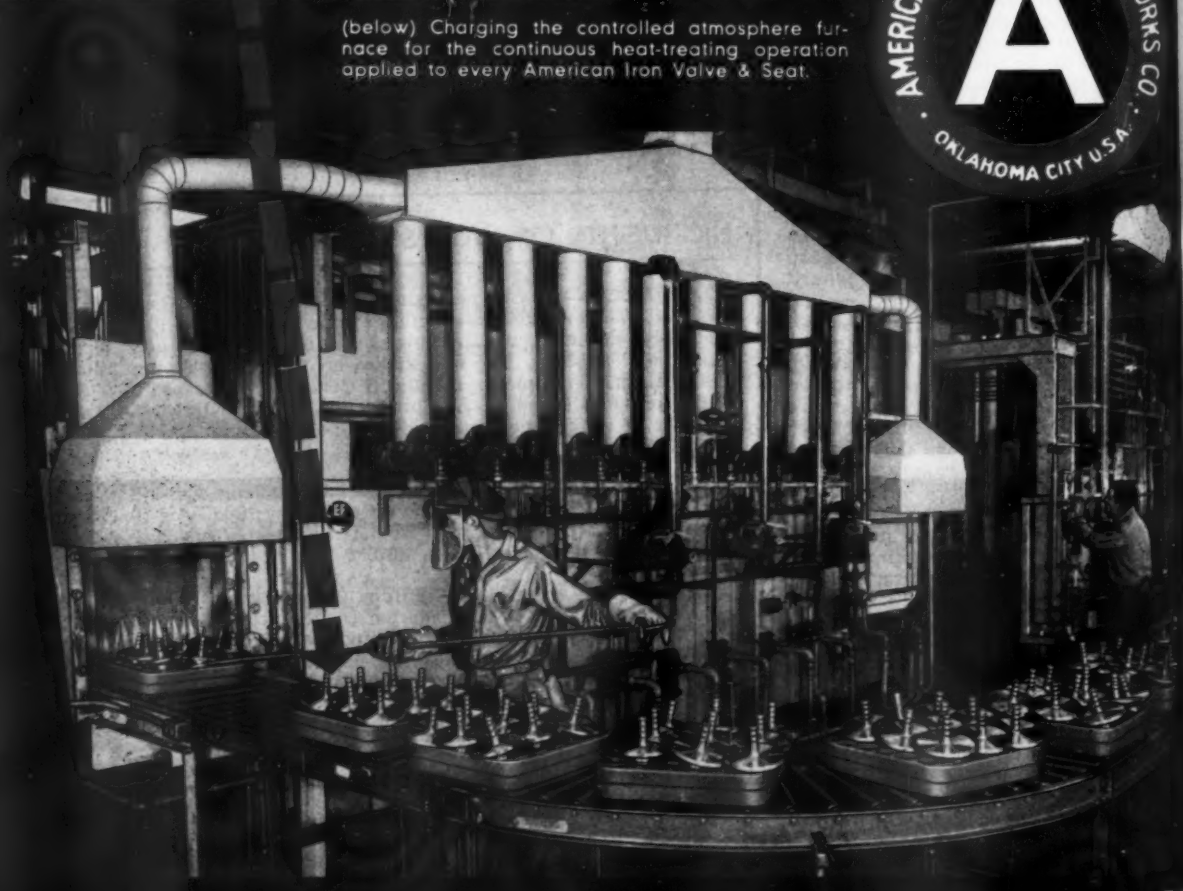

N. CENTRAL TEXAS

Three Tests Staked Near Potential Pool Opener

WICHITA FALLS.—Stonewall County gained three explorations as its prospective Bend conglomerate producer, Norsworthy 1 Wiley, 44-G-Alice Stephenson Survey, was running pipe for completion. The well had been delayed due to weather. Previously it flowed at the rate of 50 bbl. of oil an hour on drill-stem test from 5,985-6,005 ft.

The new operations were C. L. Norsworthy 1 D. J. Herbat, located 660 ft. out of the northwest corner of Section 60, Block D, H&TC, which is about 9 miles south of the 1 Wiley. Contract depth is 6,500 ft., or to the Ellenburger.

Roark & Hooker and A. G. Hill staked location for 1 C. L. Williams, 467 ft. from south and west lines of the SW quarter of 6-C-AB&M Survey, 8 miles northeast of Aspermont and about 3 miles south and a little east of the Wiley well. It was also scheduled to 6,500 ft., or the Ellenburger.

Columbia Fuel Corp. had made tentative location for a 7,000-ft. Ellenburger test in northern Stonewall County, as the 1 Calloway, SW NW 42-F-H&TC. Location would be on a Honolulu Oil Co. farmout, about 1 mile east of Barnsdall and Atlantic's 1 Sloane Calloway in Section 62, which was dry at 6,350 ft., and about 9 miles northwest of the Norsworthy 1 Wiley.

In Montague County, The Texas Co. 1 P. E. Boedecker, Block 2852, TE&L Survey, 4½ miles southwest of the Queens Peak field, flowed 168 bbl. of wash water and 13½ bbl. of oil in 24 hours, following a 1,000-gal. acid treatment from 6,782-6,820 ft. in the Viola limestone. A later report credited the well with flowing 125 bbl. of oil in 21 hours through 16/64-in. tubing choke, with flowing pressure on tubing ranging from 302 psi. at the start to 200 psi. at end of the test. Production was from the same set of casing perforations.

The Texas Co. staked location for another Montague County wildcat as the 1 J. B. Zetzsche, 660 ft. from southeast and southwest lines of Block 41, Hill County School Lands, 2 miles southeast of Bowie and 5 miles west of the Richardson-Caddo field. It was scheduled to 7,200 ft.

In southwestern Wise County, Harry C. and J. L. Trentman 1 S. L. Kitch, S. Armstrong Survey, topped the Caddo lime at 3,993 ft., drilled to 4,010 ft. and set casing at 4,006 ft. to test. Further details had not been released.

NORTH TEXAS (DISTRICTS 9 AND 7-B) SUCCESSFUL WILDCATS

Archer County: Republic Natural Gas Co. 1 T. L. Norris, 6-1-H&TC, A-904, 8 mi. S Wichita Falls, TD 4,724 ft., elevation 966 ft., top Strawn pay 4,698 ft., IP flowed 80 bbl. 42°-gravity oil in 5 hr., 32/64-in. choke, GOR 600 cu. ft.

Callahan County: McElroy Ranch Co. 1 W. A. Ramsey, Sec. 2278, TE&L Sur., 3 mi. NE Putnam, TD 4,096 ft., elevation 1,628 ft., PB 3,390 ft., top Caddo 3,192 ft., perforated 3,318-28 ft., IP 12 bbl. oil a day,

Coleman County: R. B. Slusher 1 C. O. Herring, Bond & Sanders Sur. 91, 3 mi. N Trickham, TD 1,152 ft., elevation 1,606 ft., oil sand 1,140 ft., IP pumped 36 bbl. 42°-gravity oil a day.

Haskell County: Rochester Oil Co. 1 Pat Ballard, Blk. 33, Lge. 75, Red River CSL, 3 mi. SE Rochester, TD 4,834 ft., elevation 1,597 ft., sand pay 4,828 ft., IP pumped 96 bbl. 39°-gravity oil a day, shot 4,828-34 ft. with 12 jets.

Jones County: Lester & Duffield, Inc. 1 J. P. Bingham, Subd. 1, Lge. 359 Goliad CSL, 10 mi. W Anson, TD 3,290 ft., Swastika sand pay 3,282-88 ft., IP pumped 88.6 bbl. 44°-gravity oil a day, GOR 450 cu. ft.

Oxford Drilling Co. 1 Joe L. Culbertson, Sec. 6, GH&H Sur., 5 mi. E Hamlin, TD 5,064 ft., elevation 1,679 ft., Strawn 5,045 ft., pay 5,048 ft., IP flowed 436 bbl. 44°-gravity oil a day, ¼-in. choke, GOR 875 cu. ft., CP 900 psi., TP 100 psi.

Ungren & Frazier 2 J. C. Culbertson, Sec. 6, GH&H Sur., 856 ft. E No. 1, TD 3,250 ft., pay 3,232 ft., IP pumped 122 bbl. 40°-gravity oil a day, plus 40 per cent water, Swastika sand 3,232-50 ft.

Montague County: Bluff Creek Oil Co. 1 Naomi Jameson, S. F. Maines Sur., A-501, 1½ mi. W Montague, TD 5,767 ft., elevation 1,042 ft., conglomerate pay 5,756 ft., IP pumped 42 bbl. 41°-gravity oil in 6 hr., 2/16-in. choke, GOR 400 cu. ft., CP 500 psi., TP 200 psi.

NORTH TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: Fain & McGaha 1 Leon Deaton, M. Fanning Sur., A-128, 5 mi. E Holliday, dry, TD 4,295 ft., elevation 1,004 ft.

Ted Weiner 1 G. W. Dugan Estate, Blk. 2, G. W. Dugan Sur., 10 mi. W Archer City, dry, TD 4,305 ft.

Callahan County: Ungren & Frazier 3 Elma Jackson, Sec. 17, TERR Sur., 7 mi. N Baird, dry, TD 1,241 ft.

Clay County: J. H. Krahenbuhl 1 Parker CSL, Blk. 63, Parker CSL, 10 mi. N Henrietta, dry, TD 2,000 ft.

J. H. Krahenbuhl 1 Parker CSL, Blk. 62, Parker CSL, 4 mi. SE Petrolia, dry, TD 2,002 ft.

Eastland County: Isett, Watson & Heller 1 Phillip Heirs, George Click Sur. 971, 2½ mi. NW Pioneer, dry, TD 635 ft.

Haskell County: Robinson-Puckett, Inc. 1 Herbert Mueller, G. Harris Sur., 50, A-157, 6 mi. NW Stamford, dry, TD 5,698 ft., elevation 1,508 ft., Flippen 2,220 ft., Swastika 2,520 ft., Bunger lime 2,780 ft., Palo Pinto reef 3,834-3,970 ft., Ellenburger 5,598 ft.

Jack County: Mulligan & Myers 1 Otis C. Henderson, H. H. Fuquay Sur., A-217, 9 mi. SE Antelope, dry, TD 602 ft.

T. M. Weatherred 3 Cordelia Voyles, J. H. Jobe Sur., A-1398, 3 mi. S Antelope, dry, TD 547 ft., oil show 453-464 ft.

Jones County: Moutray-Moore Drilling Co. 1 Edgar Boaz, Sec. 213, Wm. D. Irvine Sur., 12 mi. SW Anson, dry, TD 3,360 ft., elevation 1,776 ft., Noodle Creek 2,510 ft., coal 2,782 ft., Flippen 2,798 ft.

Oxford Drilling Co. 1 Luddie Compton, Sec. 6, Orphan Asylum Lands, 6 mi. S Avoca, dry, TD 3,233 ft., elevation 1,611 ft., Flippen 1,941 ft., King sand 2,206 ft., reef 2,764 ft.

Taubert Drilling Co. 1 Lulu Hollis, 25-15-T&P, 4 mi. N Hawley, dry, TD 2,556 ft., Hope 2,285 ft., Gunsight 2,395 ft., King 2,455 ft., Swastika 2,520 ft.

West Central Drilling Co. 1 A. A. Black, Blk. 6, G. Martinez Sur. 194, 1 mi. N Hawley, dry, TD 2,463 ft., elevation 1,669 ft.

Shackelford County: A. M. Howsley 1 J. P. Holstein, 39-14-T&P, SW corner of county, dry, TD 1,878 ft., water sand 1,875-78 ft.

G. E. Kadane & Sons 1 N. A. Brooks "A," Sec. 45, University Lands, 2 mi. NE Moran, dry, TD 4,345 ft., elevation 1,389 ft., Ellenburger 4,296 ft.

Stephens County: J. F. & H. E. Baker 4 J. E. Glenn, Sec. 2064, TE&L Sur., 8 mi. SE Breckenridge, dry, TD 2,000 ft., Strawn sand 1,975 ft.

G. B. Cree 1 W. H. Green "A," J. E. Michamps Sur., 10 mi. W Breckenridge, dry, TD 4,684 ft., elevation 1,289 ft., Caddo 3,637 ft., Marble Falls 3,760 ft., Mississippian 4,218 ft., Ellenburger 4,520 ft.

Taylor County: Elm Oil Co. et al 1 Mrs. Jessie Brown, 30-17-T&P, 2 mi. NE Tye, dry, TD 2,702 ft., elevation 1,800 ft., no shows.

Wilbarger County: James S. Smith 1 G. G. Pribeth, 24-13-H&TC, 2 mi. SE Harold, dry, TD 2,040 ft.

Wise County: K. W. Kilpatrick 1 A. E. Albright, S. Evitts Sur., A-264, 9 mi. S SW Bridgeport, dry, TD 4,860 ft.

Young County: E. C. Norwood Drilling Co. 1 Silas C. Jeffery, Sec. 51, TE&L Sur., A1327, 5 mi. S Olney, dry, TD 839 ft., Gunsight 836 ft.

SOUTHWEST TEXAS

Shell Setting Casing in Karnes County Wildcat

CORPUS CHRISTI.—Shell Oil Co. has recovered oil on two drill-stem tests run in the 1 Ben Korzekwa, 6,400-ft. wildcat being drilled 4 miles southwest of Falls City, Karnes County. A drill-stem test was run from 6,173-78 ft., using ¼-in. choke and recovery was 90 ft. of oil and 98 ft. of oil-cut mud in 11 minutes. Bottom-hole flowing pressure was 875 psi. and shut-in pressure was 2,450 psi. Another drill-stem test was run at 6,260-65 ft., using ¼-in. choke, and in 11 minutes recovery was 600 ft. of 35°-gravity oil and 15 ft. of mud. Bottom-hole flowing pressure was 750 psi. and shut-in pressure 2,450 psi. The well is being drilled tight, but it is reported that the well is at contract depth and operators are setting casing for completion.

New pay has been opened in Ricaby field, Starr County, at the Panal Oil Co. 2 J. R. Fuentes et al. The well was drilled to a depth of 1,790 ft. and through perforations at 1,210-22 ft., it pumped 69 bbl. of 21.3°-gravity oil daily. There was no water nor gas. This new sander is located in Tract 1, Porcion 82.

Delhi Oil Corp. is running an electric log to 7,768 ft. in the 1 Lulu W. Pursch et al, a 7,900-ft. wildcat 12 miles northeast of Freer in McMullen County. On drill-stem test run at 7,180-213 ft., using ¼-in. choke, recovery was 90 ft. of heavy condensate-cut mud, and the well developed 600 psi. working pressure in 11 minutes. This prospective field opener is located in the BS&F Survey 116, Abstract 1,604.

In the same county, Stanolind Oil & Gas Co. cored the top of the Wilcox and had a good gas-condensate show above 7,086 ft. in the 1 Hagist Ranch, Inc., R. W. Mills Survey, 10 miles north of Freer. The company is coring ahead at 7,086 ft. The well is located approximately 1¼ miles west of Delhi's 1 Pursch.

The 37 new locations include 9 wildcat starts, one each in Jim Hogg, Nueces, San Patricio, Webb, Bexar, Caldwell and McMullen counties, and 2 in Duval County. There were 2 successful exploratory wells completed, 1 each in McMullen and Zapata counties, while 11 were dry, 1 each in Bexar, Medina, Aransas, Duval, Jim Wells, San Patricio, and Starr counties, and 2 each in Nueces and Webb counties.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCATS

McMullen County: Oil discovery—George W. Graham 1 George T. Jambers, James Freal Sur. 155, A-189, 8 mi. NW of Calliham, top pay 5,900 ft., perf. 5,899-902 ft., TD 5,903 ft., IP: 120 bbl. oil per day, 10/64-in. choke, TP 600 psi., CP 975 psi., 42.9° gravity.

Zapata County: Oil discovery—C. C. Tedford et al B-1 Cuellar Bros., TCRR Sur. 245, Cert. 429, 25 mi. S of Mirando City, TD 1,340 ft., OH 1,319-40 ft., IP: 3 bbl. oil per day on pump, 24.8° gravity.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Aransas County: George W. Graham & Emory M. Spencer 1 F. J. Brundrett, Wm. S. Tutton Sur., dry, TD 8,053 ft.

Bexar County: P. E. Schnitz et al 1 L. A. Barth, 4 mi. SW of San Antonio, dry, TD 433 ft.

Duval County: Sunray Oil Corp. 38 Duval County Ranch Co., BS&F Sur. 103, 11 mi. NW of Freer, dry, TD 1,353 ft.

Jim Wells County: H. R. Smith & Thomas E. Berry et al 1 Mrs. W. W. West et al, Juan Jose de la Garza Montemayor Sur., 1½ mi. SE of Sandia, dry, TD 5,052 ft.

Medina County: W. F. Pegg 1 Hartley E.

Howard, E. C. Durst Sur., 13 mi. NW of Devine, dry, TD 1,066 ft.

Nueces County: Henderson & Slayton 1 F. O. Bancroft, Cuadrilla Irrig. Co. Sur. 138, A-578, 2 mi. SE of Baldwin field, dry, TD 8,675 ft.

Fred W. Shield & J. A. Chapman 1 J. L. Hoting, Dolores I & A Co. Sur. 144, dry, TD 8,514 ft.

San Patriocio County: W. R. Quin & J. R. Hunter et al 1 D. Zwieg, Sec. 54, 5th addition to Taft Farm lands, 7 mi. NE of Gregory, dry, TD 9,748 ft.

Starr County: R. H. Abercrombie-V. F. Neuhaus 1 Sugarland Industries, Porcion 91, 20 mi. NE of Rio Grande City, dry, TD 6,510 ft.

Webb County: Killam & Hurd, Inc. 2 Bruni Estate, Brown Subd., Albercas Grant, 9½ mi. SW of Bruni, dry, TD 2,244 ft.

Tiger Minerals Corp. 1 W. R. Nicholson, BS&F Sur. 479, dry, TD 2,830 ft.

MICHIGAN

Potential Gas Discovery In Berea Being Tested

MOUNT PLEASANT. — A potential new Berea gas discovery well was being tested at Charles D. Hoffman & Clark People's 1 Buchanan, NW NW SE 19-11n-15w, Cedard Creek Township wildcat, Muskegon County, this week.

The wildcat, originally scheduled to be drilled to the Dundee as an oil test, showed 750,000 cu. ft. of gas on gage at 1,118 ft. The hole was deepened to approximately 1,128 ft. with some indications of an increase in gas flow. Top of so-called Berea section was logged at 1,117 ft. Operators indicated that this well may be saved as a gas well.

If a potentially important gas reserve can be developed in this area, a ready market awaits it at Muskegon, a Michigan industrial center located about 8 miles southeast of the well. A gas line carrying other Michigan gas to industries in Muskegon is located about 6 miles from this new well.

Hoffman & Peoples own an acreage block of about 1,400-1,500 acres around this wildcat. Only other acreage owner in the area is Muskegon Development Co.

Robert Bond's 1 Krivestky, NE SE NW 12-20n-1w, Butman Township, Gladwin County, east 40-acre offset to Superior Oil Co.'s Richfield zone discovery and the first well to reach the objective since the discovery, swabbed 16 bbl. of oil and 4 bbl. of salt water the first day. Well was being tested following acid treatment with 1,000 gal. This Richfield well is bottomed out at 4,992 ft. Pay zones were picked at 4,921-31 ft.

MICHIGAN SUCCESSFUL WILDCAT

Bay County, Gibson Township: Ervin Major 1 Koelsch, NE NW NW 11-18n-3e, Traverse 2,050 ft., 3 bbl., TD 2,174 ft., PB to 2,124 ft.

MICHIGAN WILDCAT FAILURES

Benzie County, Weldon Township: Mercer Oil Co., Inc. 1 Benzie-State, NE NE NE 29-25n-14w, Traverse 1,200 ft., dry, TD 1,231 ft.

Montcalm County, Sidney Township: Mercer Oil Co., Inc. 1 Ehle, NE SE SW 24-10n-7w, Dundee 3,204 ft., dry, TD 3,278 ft.

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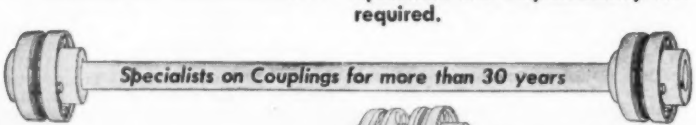

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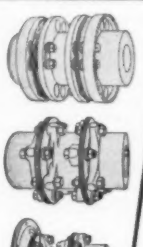

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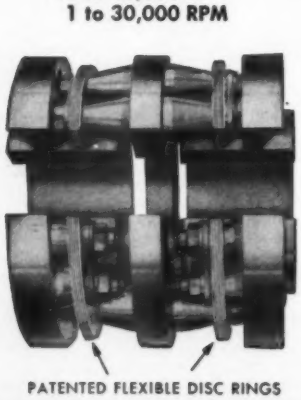

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SOUTH LOUISIANA

Humble Opens New Sector On Lake Washington Dome

NEW ORLEANS.—Humble Oil & Refining Co. has opened a new producing sector on the Lake Washington dome, Plaquemines Parish. The company's 29 Cockrell-Moran flowed 153 bbl. of 35°-gravity oil daily through a ⅛-in. choke, with 650 psi. tubing pressure. The well is bottomed in salt at 7,804 ft. and is producing from the 7,200-ft. level. Exact location of the new producer is 7,798 ft. south and 1,981 ft. west of USC&GS station "Wash."

Off Jefferson Parish, Humble C-3 State Lease 803, on initial test, flowed 72 bbl. of oil per day plus 22 per cent salt water through a 3/16-in. choke. Production is through perforations at 8,504-08 ft. Estimated tubing pressure was 100 to 300 psi. The hole was drilled to a depth of 9,310 ft. and has 7-in. casing set to 9,308 ft.

Magnolia Petroleum Co. has plugged and abandoned its Block 95 wildcat offshore from St. Mary Parish after the casing collapsed. Favorable gas-condensate sands were encountered in the well, and operators now plan to cut and pull the 7-in. casing and drill the C-2 well, a deviated hole, in an effort to tap the same sands.

The same company continues to core ahead in its St. Landry Parish wildcat, 1 Alice B. Rozas, 41-6s-4e. Last core was taken at 13,703 ft. No shows have been reported for the wildcat, although the operators have been coring extensively. Projected depth is 14,000 ft.

Southwest of the Lake Washington area Placid Oil Co. and The Texas Co. have completed the 5 Louisiana Land & Exploration Co. for 178 bbl. of 36.7°-gravity oil daily through a ⅛-in. choke. Production is through perforations at 7,824-34 ft., and on the gage the well showed a tubing pressure of 1,400 psi. The well was drilled to a depth of 10,032 ft. and has 7½-in. casing set to 9,584 ft. Exact location of the new discovery is 1,980 ft. east and 660 ft. north of the southwest corner of 1-21s-26e.

SOUTH LOUISIANA WILDCAT FAILURES

Acadia Parish: New oil discovery—Kirby Petroleum Co. 1 Maggie McKain Kerr.

11-9s-1w, 4 mi. NE of Egan production, TD 11,012 ft., top pay 10,039 ft., perf. 10,039-43 ft., IP: 220 bbl. oil per day, 9/64-in. choke, TP 1,225 psi., 39.7° gravity.

Plaquemines Parish: New oil discovery—Placid Oil Co. & The Texas Co. 1 St. of La.-LL&E 5, 3 mi. S of Lake Washington area, TD 10,032 ft., top pay 7,824 ft., perf. 7,824-34 ft., IP: 178 bbl. oil per day, ½-in. choke, TP 1,400 psi., 37.5° gravity.

SOUTH LOUISIANA WILDCAT FAILURES

Cameron Parish: The Texas Co. 1 Mrs. Edith W. Donner et al, 4-13s-3w, 3 mi. E-NE Grand Lake production, dry, TD 11,224 ft.

Jefferson Parish: Robert W. O'Meara 1 P. J. Unkel, 21-10s-4w, ¾ mi. SW of S. Roanoke production, dry, TD 10,500 ft.

Plaquemines Parish: William Helis 1 State Lease 912, Tract 1,885, offshore, dry, TD 9,876 ft.

LA.-ARK.

Sinclair's Bossier Parish Wildcat Proves Dry

SHREVEPORT. — After many cores and tests, Sinclair Oil & Gas Co. 1 Vera Oden, 33-19n-13w, Bossier Parish wildcat, was dry at 8,720 ft., in the Cotton Valley formation.

A core from 8,482-8,529 ft., in the Bodcaw section, recovered shale and tight sandstone, which was not tested. Last core was from 8,695-8,720 ft., which recovered 6 ft. of tight sand with a slight oil show, 1 ft. of shale and 16 ft. of tight sand with no shows. Operators ran electrical surveys and prepared to abandon.

Bert Fields 1 Thigpen-Herold, 23-16n-16w, Caddo Parish wildcat, was also dry, with total depth at 9,004 ft., in the Cotton Valley. Last test reported was through perforations in the Travis Peak at 7,544-90 ft., which yielded salt water in swabbing, following a treatment of 500 gal. of acid.

Caddo Parish gained a new exploratory well as W. E. Hall and others 1 Jacobs Land Co., 7-18n-15w, 3 miles east of the Longwood field. Operators were drilling ahead below 3,960 ft., in the lower Cretaceous.

In Catahoula Parish, Roy L. Fisher 1 Zenoria Lumber Co., NW NE NW 27-8n-6e, new Wilcox wildcat 2 miles northwest of Jonesville, was in the Wilcox at 5,290 ft. Tests or shows had not been reported.

Petersen Drilling Co. 1 Womack & Cotton, deep test in the Willow Lake field of Catahoula Parish, cored light shows of oil in sandstone from 9,559-68 and 9,589-98 ft. A drill-stem test from 9,589-98 ft. had a plugged tool and operators prepared to retest. The section to be tested was identified as the Tuscaloosa.

In Morehouse Parish, Barnsdall Oil Co. 1 Crossett Lumber Co., 3-23n-7e, recovered 3,800 ft. of salt water on a 1-hour drill-stem test from 5,257-89 ft. Total depth was 5,447 ft., in the Smackover. Light oil shows in drill cuttings were reported at 5,178-90 and 5,330-40 ft.

ARKANSAS WILDCAT FAILURES

Miller County: Pan American Southern 1 A. G. Magee, E½ NE SW 19-17s-25w, dry, TD 6,600 ft., elevation 227 ft., Nacotoch 1,744 ft., Saratoga 2,231 ft., Buckner 2,763 ft., Tokio 3,135 ft., Paluxy 3,500 ft., massive anhydrite 5,000-5,133 ft., James 5,604-97 ft., Travis Peak 6,045 ft.

Ouachita County: Garland Anthony 1 Mike Berg, NE SW 15-13s-17w, dry, TD 4,250 ft.

C. G. Davis 1 R. B. Allen, SW NW SW 33-14s-19w, dry, TD 2,976 ft.

CALIFORNIA

Three Offsets to Superior Discovery Nearing Pay Level

LOS ANGELES.—Increased drilling activity in areas surrounding the two recent discoveries in the northern portion of the Cuyama Valley is serving to offset declining activity in the valley's two older fields, Russell Ranch and South Cuyama. In the latter seven rigs are now at work while in Russell Ranch only two are listed.

Northwest of Russell Ranch, north, east and southwest offsets to Superior Oil Co.'s recent discovery in Section 2-11n-18w, are nearing the pay level. Superior is drilling the former two while the latter is by Southern California Petroleum Co. Richfield Petroleum Co. is starting a southeasterly offset. It also has staked a northwest offset to the discovery but apparently is awaiting the outcome of the north offset, Superior's No. 12-2 U. S. Government.

One-half mile southwest of the group of drilling wells, Southern California is attempting to complete the northwesterly offset to its recent shallow Morales sand discovery. Casing has been set at 2,113 ft. in this possible extensioner, its 54-10 Schlaudeman, with total depth being given by the company as 2,117 ft. in "good oil sand." Two locations south of this discovery, Bishop Oil Co. is preparing to start drilling its No. 67-10 well in SW Sec. 10-11n-28w.

In Wilmington field's Terminal area re-

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completion of earthquake-damaged producers has increased in tempo until some four or five are being revived weekly. Of the approximately 30 rigs at work, about 20 are engaged in this workover program. Several techniques are used in redrilling, but in many instances some 2,500 to 3,000 ft. or more of hole is made in restoring the wells. Some 200 producers were severely damaged by the field's most recent "subsidence" shift, which involved an earth movement of about 8 in. at depths of around 1,600 ft.

CALIFORNIA WILDCAT FAILURES

Kern County, Comanche Point area: R. E. Bering 1 Tejon, 18-32s-30e, dry, Santa Margarita 621 ft., TD 1,878 ft., elev. 826 ft.

San Luis Obispo, Carrizo Plains area: Universal Consolidated Oil Co. 1 SML-Humble, 24-32s-19e, dry, TD 8,300 ft., elev. 3,050 ft.

APPALACHIAN FIELD

Three Operations Begun In Limestone Hill Area

PITTSBURGH.—Work has been started at three new locations in the Limestone Hill area, West Virginia: Steele district, Wood County, Belleville Quadrangle, Hope Natural Gas Co. 9445 Frank Gilmore, elevation 1,016 ft., .80 mile south of Latitude 39° .05′, and 2.40 miles west of Longitude 81° 30′; Godfrey L. Cabot, Inc. 1-1329 O. E. Crow, elevation 855 ft., 5.80 miles south of Latitude 39° 10′, and 2.15 miles west of Longitude 81° 30′. Tucker district, Wirt County, Belleville Quadrangle, Godfrey L. Cabot, Inc. 1-1328 fee (W. T. Gant Tract), elevation 763 ft., 2.55 miles south of Latitude 39° .05′, and 1.70 miles west of Longitude 81° 30′. In Dry Fork district, Tucker County, Cumberland & Allegheny Gas Co. 1-A-425 Jason Harmon, elevation 3,304 ft., topped the Onondaga at 8,181 ft. and encountered a gas blow-out at 8,193 ft. Two good shallow producers were reported: Triadelphia district, Logan County, Hope Natural Gas Co. 9411 Ed Cook, elevation 998 ft., gaged 3,411,000 cu. ft. of gas after shot in the Berea sand, total depth 3,075 ft.; Union district, Jackson County, this company's 9418 Ella Beckwith, elevation 613 ft., tested 1,981,000 cu. ft. of gas after shot in the brown shale, total depth 3,703 ft.

In Unity Township, Westmoreland County, Pennsylvania, Peoples Natural Gas Co. 1-3921 Fred Musnug, elevation 2,100 ft., is drilling at 716 ft. In Georges Township, Fayette County, Orville Eberly et al 1 N. E. Murphy, elevation 2,560 ft., is drilling at 7,718 ft.

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CANADIAN FIELDS

Extension Assured For Excelsior Field

CALGARY.—Excelsior field, about 12 miles north of Edmonton, rated a 1-mile north extension when an Edmonton independent firm's test had a flow of oil to the surface from the Devonian D2 zone. The new success is the first venture for Metro Oil & Gas Co. The key well, Metro 1, in LSD 1, 15-56-24w4, is located about midway between previous production and dry holes, north of Imperial's oil wells. It is about 1 mile north-northwest of Imperial-Excelsior 5, assured oil well now completing, and ¾ mile southeast of Leduc Calmar's failure. The D2 was topped at 3,875 ft., or 1,567 ft. subsea. The first drill-stem test, at 3,868-89 ft., flowed oil to the surface in 1 hour and rated a natural gas flow of 139,000 cu. ft. daily. A second test, of the interval 3,889-3,914 ft., gave a flow of oil to the surface 27 minutes after the valve was opened, with gas flow of 158,000 cu. ft. daily. No water was received on either tests. Coring and testing is continuing.

The North Woodbend 1 well, seeking a mile extension to the north Leduc-Woodbend field, continues to get encouragement from upper formations. Earlier this month natural gas in substantial volume was obtained in a drill-stem test of the Viking sand. During the past week, tests of basal Cretaceous sands have given considerably more natural gas, plus evidence of some naphtha content.

Still ahead are the D1, D2, and D3 sections of the Devonian, slated to provide their answer in around another 1,000 ft. Drilling is currently proceeding below 4,200 ft. Two basal Cretaceous drill-stem tests have been run. The latest, of the interval 4,179-87 ft., gave a maximum daily natural gas flow rate of 4,090,000 cu. ft. Pipe recovery after the 48-minute test was 3 ft. of naphtha. A previous test, of interval 4,155-80 ft., gave a natural gas flow rate of 1,500,000 cu. ft. daily in 1 hour, plus pipe recovery of 60 ft. of gassy mud.

In the Viking sand interval of 3,420-30 ft., the well had a maximum natural gas flow rate of 2,500,000 cu. ft. daily, plus a pipe recovery of 5 ft. of drilling mud. Wellsite is in LSD 2, 28-51-26w4.

An indicated commercial oil showing has been obtained at the Trend-Royalite-Bolloque Lake 1 wildcat during a test of the lower Cretaceous sands. The well, located in LSD 8, 22-64-26w4, about 65 miles north of Edmonton, was drilled to 3,880 ft., as a Devonian test. The objective was abandoned, and hole was plugged back to the lower Cretaceous where substantial natural gas flows had been received during drill-stem testing. Some evidence of oil had shown.

The well was plugged back to 2,810 ft. and a 12-ft. interval above that depth was

perforated. According to a company official the well flowed oil to the surface during drill-stem tests after perforating, and a natural gas flow was measured at around 1,500,000 cu. ft. daily. Fluid recovery on the 1-hour test was said to be 510 ft. of watercut oil. A temporary plug has been put in the hole at around 2,500 ft., above the potential producing zone, and a plate has capped the top of the hole, pending the move on of a service unit to run a squeeze cement job in an effort to shut off the formation water.

Eighteen wells were completed in Alberta during the past week, all but one of which resulted in oil production. The week's total has boosted the tally for the 140-day period of this year to 273, including 200 oil wells, 7 gas wells, and 66 failures.

TEXAS GULF COAST

Midstates Finds Oil Pay In Frelsburg Field

HOUSTON.—New oil pay has been opened in Frelsburg field of Colorado County, which heretofore has been a gas-distillate field. Midstates Oil Corp. 1 John Suchadoll, F. Zimmerscheidt Survey, has been dually completed for both oil and distillate, and may be a new pool opener. Through perforations at 9,276-86 ft., the well tested 86 bbl. of 51.2°-gravity distillate and 1,000,000 cu. ft. of gas daily through ¼-in. choke. Through perforations in the Wilcox at 8,120-32 ft., the well flowed 61 bbl. of 36.5°-gravity oil daily through 3/16-in. choke. The well is bottomed at 9,600 ft. and has 5½-in. casing set at 9,540 ft.

Skelly Oil Co. has resumed coring below 7,720 ft. in sand and shale at its closely watched Brazoria County wildcat, the 1 E. O. Koutnik, 5 miles south of Sandy Point field, W. D. C. Hall Survey, Abstract 69. On 23-minute drill-stem test at 7,714-20 ft., the wildcat developed 12½ psi. working pressure, and blew gas, oil and salt water for 45 minutes. On drill-stem test at 7,527-31 ft., recovery was 67 dry stands, 12 stands of water and oil, and two singles of salt water.

A southwest extension of 1 mile has been successfully completed in the Nona Mills area, just southwest of Kountze, Hardin County. General Crude Oil Co. has brought in the 2 Nona Mills Co. as a good oil producer, flowing at the rate of 183 bbl. of oil per day on an initial 16-hour test through perforations at 8,271-77 ft. Tubing pressure was 1,075 psi. This extension is located in the BBB&C RR Survey, A-107.

Although no detailed information is known, G. S. Hammonds 1 Walter Schenider, James Cummings Survey, Abstract 31, Austin County wildcat, is reported to be drilling below 10,590 ft. Unofficial reports indicate that the wildcat recovered five stands of oil and 2½ stands of oil and gas-cut mud on drill-stem test at 10,067-72 ft., and that other shows have been logged in the well.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCATS

Colorado County: New pay at Frelsburg—Midstates Oil Corp. 1 Suchadoll, F. A. Zimmerschield Sur., A-629, dual completions, lower perfs. 9,276-86 ft., IP: 86 bbl. distillate per day, 51.2° gravity, ¼-in. choke, TD 9,600 ft., perf. (Wilcox) 8,120-32 ft., IP: 61 bbl. oil per day, 3/16-in. choke, 36.5° gravity, TP 50-175 psi., CP 2,00 shut in.

Fort Bend County: New pay at Boling Dome—Callery & Hurt 2 John Kasparek, Simon & Miller League 2, 4 mi. NE of Boling townsite, TD 3,598 ft., top pay 3,590 ft., perf. OH 3,589-98 ft., IP: 128 bbl. oil per day, 21.8° gravity.

Goliad County: Gas discovery—Ranger & Coffield 1 W. Karnei, James Cunningsam Sur., ¾ mi. SE of Melrose field,

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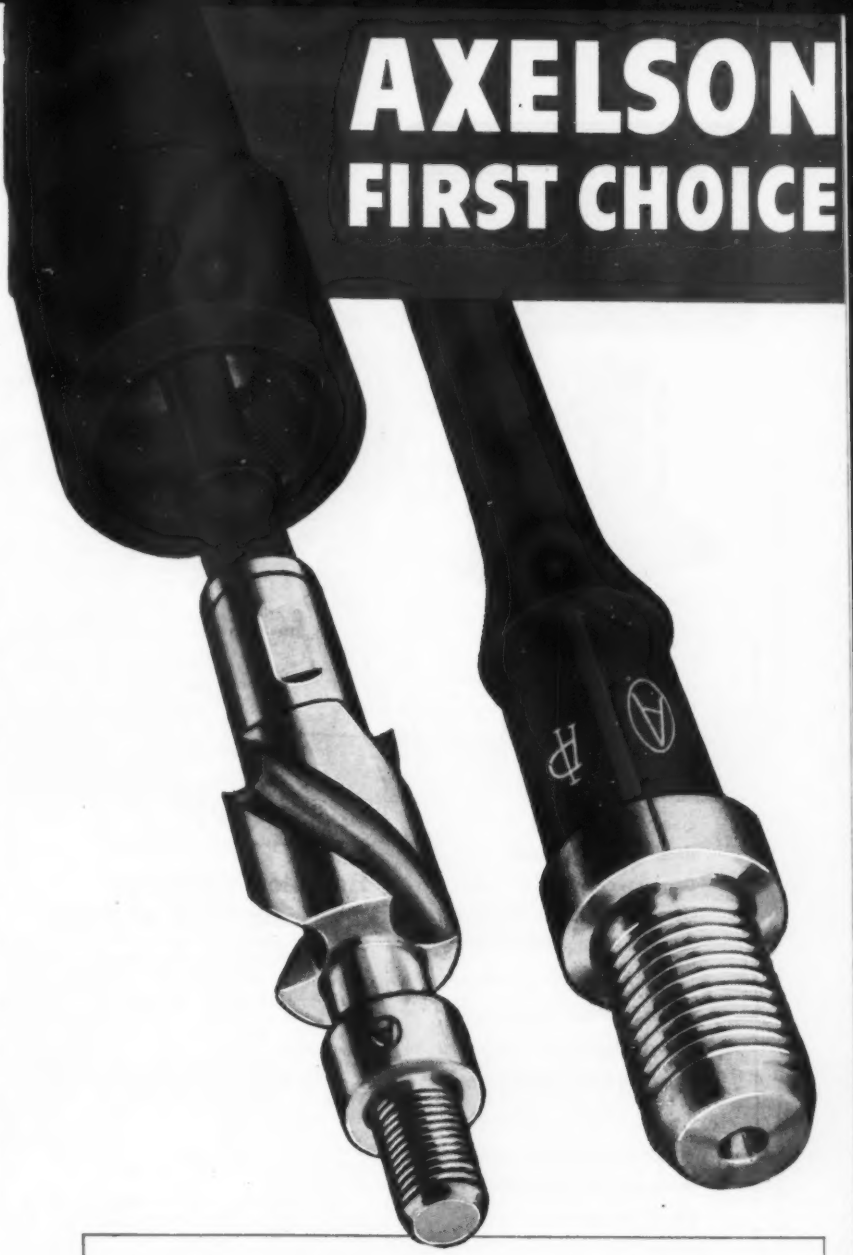

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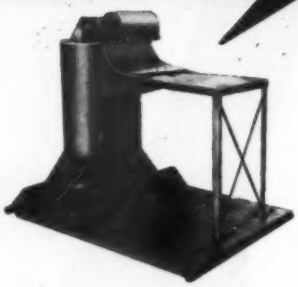

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TD 8,255 ft., perf. 7,896-906 ft., IP: 2,000,000 cu. ft. of gas, 7/64-in. choke, TP 1,900 psi., no open flow gage.

Orange County: Gas-distillate discovery, "Echo field"—Pacific Producing Corp. 1 First National Bank of Orange, Theron Strong Sur., A-25, 2½ mi. N of Orange, dual completion, TD 8,946 ft., perf. 8,146-52 ft., IP: 2,545,000 cu. ft. of gas per day plus 44 bbl. distillate, 56.6° gravity, perf. 8,276-80 ft., IP: 10,400,000 cu. ft. of gas per day, open flow, SIP 3,013 psi.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Fort Bend County: Callery & Hurt, Inc. 2 Texas Gulf Sulphur, Simon & Miller League 2, 7 mi. E of Boling, dry, TD 2,763 ft.

Lavaca County: Shell Oil Co. 2 Steinmann-King, HT&B RR Sur., A-245, 2 mi. NE of Provident City field, dry, TD 8,800 ft.

Liberty County: H. B. Hebert et al 1 Sarah A. Quinn et al, W. B. Reed Sur., A-99, 6 mi. SE of Devers townsite, dry, TD 7,920 ft.

Quintana Petroleum Corp. 1 B. E. Quinn, Spencer Kirkham League, A-57, 8 mi. NE of Cleveland, dry, TD 9,588 ft.

Live Oak County: Henderson Coquat 2 W. H. Herring, John Buchanan Sur., 8 mi. SW of Three Rivers, dry, TD 8,014 ft.

Orange County: Colony Oil & Gas Co. 1 Q. A. Sikes, Theron Strong Sur., 2 mi. NW of Orange, dry, TD 9,027 ft.

Wharton County: J. B. Ferguson & J. P. Petkas 1 Ben F. Labay, Wm. Vess Sur., dry, TD 5,500 ft.

MISSISSIPPI

Humble Completing Alabama Well on Pump

JACKSON.—In Clarke County, Alabama, approximately 37 miles northeast of Mobile, Humble Oil & Refining Co. is in the process of completing the 1 Marion Davies et al, SW NW 15-3n-2e, on pump. Final completion of the well will be made at 5,419-29 ft. This is the interval from which tests in open hole had recovered oil with no water. Drill-stem test was run using 1-in. top and ⅜-in. bottom chokes, and recovery was 400 ft. of mud and 4,800 ft. of mud-cut oil in 19 hours. Operators are now waiting on pumping equipment to be installed.

This well was cored extensively from 4,275 to 7,314 ft., and 11 drill-stem tests were made at various intervals. The well is bottomed at 8,093 ft. and plugged back to 7,385 ft. with 7-in. casing set at that depth.

The Pickens field Lower Cretaceous play experienced another disappointment when Dan Reynolds 1 Mattie Hart et al, SE NW 24-12n-2e, was abandoned as a dry hole at total depth of 7,739 ft. A show of oil was recovered in side-wall samples from sand at 6,355-70 ft. just below a fault at top of Lower Cretaceous. Drill-stem test of this sand in open hole recovered salt water with a show of oil.

Meanwhile, in new West Lincoln field, Lincoln County, Mississippi, Roeser & Pendleton, Inc. 1 Holloway, 14-6n-6e, and the 1 Roberts, 24-6n-6e, were both dry holes. No detailed information has been released on the wells. However, the discovery well for the field, Pan-American Production Co. 1 Holloway, has produced a total of 3,725 bbl. of oil in the past 32 days, an average of 116 bbl. per day.

The seven new locations in Mississippi include one wildcat start in Franklin County. There were no successful exploratory wells completed, however, two were reported dry, one each in Jefferson and Yazoo counties. In Alabama, there were three new locations staked in the Gilbertown field.

MISSISSIPPI WILDCAT FAILURES

Jefferson County: Claypool - Proctor - Lyle Cashion 1 Carrie M. Allen, 10-8n-1w, dry, TD 6,518 ft.

Yazoo County: Dan Reynolds 1 Mattie Hart et al. 24-12n-2e, dry, TD 7,738 ft.

ALABAMA WILDCAT FAILURES

Baldwin County: Geo. Lazarov-Robert Robilio Oil Group 1 Ben May, 18-1n-3e, dry, TD 7,106 ft.

Clarke County: R. G. Houser 1 S. H. Stringer, 1-10n-2w, dry, TD 3,352 ft.

ROCKY MOUNTAIN

California Co. Still Testing Important Utah Wildcat

DENVER.—Testing is still under way at the important wildcat at 1 Unit, SE NW NW 35-58-19e, on the Gusher Unit, Uintah County, Utah. The California Co. was swabbing at the rate of 25 bbl. fluid per hour with about one-third of the fluid still drilling mud.

The well is producing from Basal Green River fractured zone between 8,699-8,950 ft. after being plugged back from 9,757 ft., total depth. This zone was acidized with 5,000 gal. prior to the swab test, and it is expected that several additional days swabbing will be required before the hole is sufficiently clean for thorough production tests.

The operator has released complete information on this wildcat, which was carried as a tight hole. The well logged Green River at 5,452 ft. and Wasatch at 9,157 ft. A total of 18 drill-stem tests were taken from 5,140 ft. to 9,163 ft. Oil was recovered on tests in the Basal Green River section below 8,699 ft. This wildcat is 8 miles southeast of the Carter Oil Co.-Stanolind Oil & Gas Co. Basal Green River discovery well on the Roosevelt structure.

British American Oil Producing Co. and Plains Exploration Co. are completing their new discovery in the Armstrong area, Logan County, Colorado, after the well swabbed 120 bbl. of oil in 24 hours with a trace of water from the Dakota sand.

The well is 1 Segelke, NE NW NE 26-11n-53w, north of the town of Sterling. Casing was perforated opposite a sand between 5,406-5,621 ft. and the operator plugged back to 5,448 ft. from 5,800 ft., total depth. This is the first green-oil discovery in northeastern Colorado following the active exploratory drilling campaign started a year ago following discovery of oil in the Sidney area, Cheyenne County, Nebraska. British American and Plains have recently abandoned another wildcat in the North Proctor area, SE SE SE 18-11n-50w, with the well through Lakota at 4,932 ft., total depth. These operators have made location for 1 Thomas, SE NW SE 13-11n-53w, 3 miles northeast of their Armstrong discovery. British American and Plains have approximately 200,000 acres leased through northern Logan County and plan to continue their drilling campaign following extensive seismic work through the area.

New drilling activity is under way in the Denver-Julesburg Basin of Nebraska with the announcement of new locations by Ohio Oil Co. and Stanolind Oil & Gas Co. The Stanolind location is 1 Eldred, NE NE NW 32-20n-45w, and this will be a 3,400-ft. Dakota sand test on a 83,000-acre ranch where Stanolind has done extensive seismic work. Ohio has made two new locations in its Huntsman pool, where the company now has four gas wells and one oil well in the Third Dakota sand. Tests at Ohio's East Sidney wildcat 1 Schnell showed water in the First Dakota sand and the operator is now drilling ahead for Third Dakota.

MONTANA SUCCESSFUL WILDCAT

Southwest Pondera area, Teton County: Phillips Petroleum Co. 1 Freda Johnson,

NE NW NE 31-27n-4w; 2,251 TD; PB 2,225; 5½-in. csg. at 2,251, Blackleaf 635, Kootenai 1,455, Morrison 1,920, Swift 2,025, Reardon 2,174, Madison 2,204; initial production 54 bbl. oil and 100 bbl. water per day.

NEBRASKA WILDCAT FAILURE

Sidney area, Cheyenne County: Roberts Brothers 1 Elsasser, C NE NW 25-14n-50w, plugged and abandoned; 4,879 TD; Dakota 4,681.

WYOMING NEW PAY

Johnson County, North Meadow Creek area: The Mimi Corp. 3-A Federal-Hill, SE NE NE 34-42n-78w, TD 4,464 ft., 7-in. casing at 4,437 ft., Sussex 3,986 ft., Shannon 4,436 ft., flowed 30 bbl. of oil per day from Shannon, ¼-in. choke.

EASTERN TEXAS

Union Continues Testing Cherokee County Wildcat

DALLAS.—Union Producing Co. continued to drill-stem test on oil shows in its 1 Sanders, J. J. Anthony Survey, Cherokee County wildcat 8½ miles northeast of Jacksonville. Cores were taken all last week and four drill-stem tests had been made. At last report the fifth test was being run from 4,398-4,448 ft.

The third test, from 4,322-31 ft., was open 20 minutes and recovered 5 gal. of condensate cut with mud. Bottom-hole flowing pressure was 1,750 psi. and shut-in bottom-hole pressure was 1,775 psi. A core from 4,340-50 ft. recovered 7 ft. of porous sand with gas odor. Then a 16-minute test was made from 4,342-50 ft., recovering 10 ft. of distillate cut with mud. The last core, from 4,398-4,448 ft., recovered 50 ft., being 5 ft. of siltstone and 45 ft. of porous sand with streaks of shale.

In Limestone County, 4 miles west of Mexia, Great Expectations Oil Corp. abandoned its 1 J. P. Key at total depth of 2,984 ft., after a drill-stem test from 2,804-07 ft. recovered 1,400 ft. of salt water with only a light show of oil. Electrical log indicated the Austin from 1,930-2,486 ft., top of the Woodbine at 2,711 ft. and the Buda lime at 2,972 ft.

Great Expectations started another wildcat in the same area, as the 1 James Anglin, a 3,000-ft. exploration located on a 138-acre tract in the P. Varella II League Grant Survey, and 4 miles west of Mexia.

Morris Coats and others 1 G. M. Fisk, wildcat 4 miles northeast of Gilmer in Upshur County, reported a drilling break at 5,445 ft. Top of the Paluxy, by the driller, was 5,313 ft., on elevation of 328 ft. A core was started from 5,445 ft. and at last report it was coming out of the hole.

EAST TEXAS (DISTRICTS 5, 6, AND 6-P) SUCCESSFUL WILDCATS

Shelby County: S. J. Carnes 1 Pickering Lumber Corp., 6 mi. E Patroon, R. S. Forbes Sur., TD 3,760 ft., elevation 293 ft., perforated Fredericksburg lime 3,667-73 ft., IP pumped 31.6 bbl. 38°-gravity oil a day, plus 23 bbl. salt water, located 4,250 ft. W and slightly N of 1 Bridges, discovery.

Wood County: W. W. Wise 1 J. E. Brown, J. C. Clark Sur., 5½ mi. NE Quitman, TD 4,744 ft., IP flowed 168 bbl. 17°-gravity oil a day, sub-Clarksville 4,440-73 ft., open hole, bottom-hole flowing pressure 125 psi.

EAST TEXAS (DISTRICTS 5, 6, AND 6-P) WILDCAT FAILURES

Denton County: Jimmie Wilson and DeForrest Kline 1 Monaghan, J. Early Sur., A-1281, 1½ mi. SE Sanger, dry, TD 1,767 ft., elevation 612 ft.

Limestone County: Great Expectations Oil Corp. 1 J. P. Key, Rozelia Scott Sur., 4 mi. W Mexia, dry, TD 2,984 ft., eleva-

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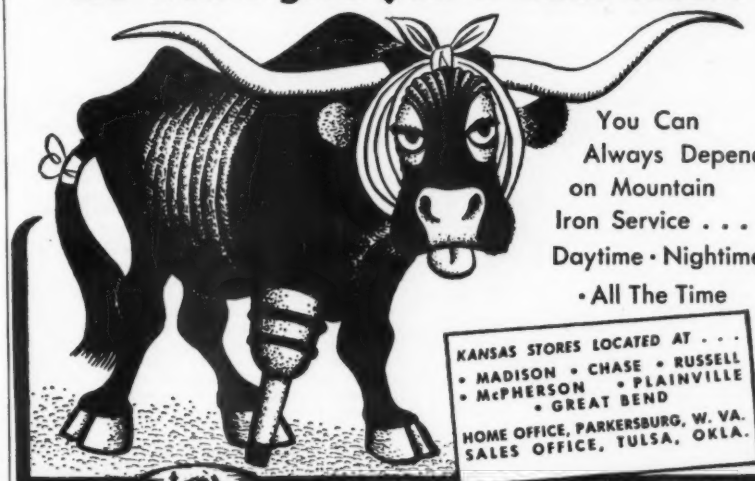

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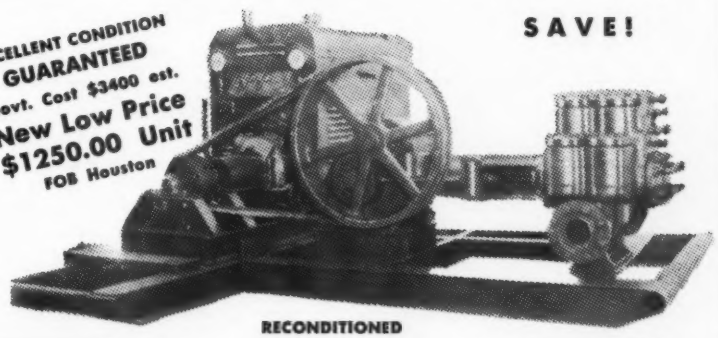

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PERMIAN BASIN

Honolulu Preparing to Drill Reef-Strike Offset

MIDLAND.—Honolulu Oil Corp. and Signal Oil & Gas Co. had not taken potential test at their 1-13 Underwood, Hockley County Canyon reef discovery, but were said to be moving the rig one location north for the J. C. Hopper, located 510 ft. out of the southeast corner of Labor 8, League 5, Wilbarger County School Land. The discovery had some 20 ft. of possible pay in the Wolfcamp section, which was not tested.

According to a release from the operators, a drill-stem test to determine water level in the 1-13 Underwood was made from 9,290-9,319 ft. Seven-inch casing had been set on bottom at 9,310 ft., then drilled out to 9,319 ft. On the 4-hour drill-stem test, gas came to the top in 4 minutes, drilling mud in 11 minutes and oil in 14 minutes.

The well flowed 84 bbl. of oil the first hour, 79 bbl. the second hour and an average of 77 bbl. for the third and fourth hours. The oil was 42°-gravity, clean and with no water. At last report it was shut in to run tubing for completion.

While the discovery has been called Canyon reef, some geologists have identified the pay as the Cisco lime of the Pennsylvanian, which is just above the reef.

A 2-mile southeast extension was in prospect to the Vealmoor field of northern Howard County at Seaboard Oil Co. of Delaware 1 Akin Simpson, NE NE 45-32-3N-T&P. The well was said to be a little low to the field, with top of the reef at 8,015 ft., or minus 5,272 ft.

A drill-stem test in the 1 Simpson, open 2 hours from 8,015-35 ft., had gas in 8 minutes, followed by mud and oil in 12 minutes. It flowed 8 bbl. of oil in the first hour through 12/64-in. choke and 27 bbl. the second hour through ¼-in. choke. Flowing pressure was 1,050 psi. and oil was 46°-gravity. Operators were coming out of the hole.

In Kent County, Nelson Bunker Hunt 1 Burnett, west offset to the 1 J. W. Young, Canyon lime discovery, 7½ miles northwest of Clairemont, kicked off and flowed oil and acid water at the rate of 40 bbl. an hour, through ¼-in. tubing choke. The fluid was estimated to be about 28 per cent acid water and drilling mud and the remainder oil.

The 1 Burnett is the third producer for the field. Production was from perforations in casing at 6,464-85 and 6,495-6,516 ft. It was flowing to clean at last report. Location is 1,110 ft. from north and 467 ft. from east lines of Section 3, D. R. Stout Survey.

Caroline Hunt Trust Estate 2 J. W. Young, indicated second producer for the field, and ½ mile south of the discovery, was shut in for storage after flowing at the rate of 35 bbl. of oil an hour following acid treatment with 2,000 gal. through casing perforations at 6,840-6,520 ft.

General Crude and others 1-144 Young, southeast outpost to the discovery, was drilling below 4,000 ft. in shale. The same operators' 1-166 Young, 2,860 ft. north of the discovery, was drilling in shale at 5,339 ft.

Magnolia Petroleum Co. 2 Roy Parks, wildcat 11 miles southwest of Midland, was coring below 12,269 ft. in lime and shale after topping the Silurian at 12,261 ft., on elevation of 3,835 ft. The Silurian top was correlated 167 ft. high to The Texas Co. 1 Scharbauer, discovery and only producer in the Warfield Ellenburger pool.

Magnolia 1 Garza Cattle Co., southeast Lynn County discovery, was swabbing and flowing load oil from open hole at 8,615-30 ft. Operators drilled plug on 7-in. casing set on top of the pay at 8,615 ft. and conditioned hole to 8,630 ft., total depth. The well was then loaded with oil. At last report it was making an average of 20 bbl. of load oil an hour, with new oil expected at any time.

Magnolia completed its 1-42 R. T. Wilson, SE SE 42-40-4S-T&P, as the eighth producer in the Pegas field. Completion potential was 774 bbl. of 53°-gravity oil from open hole from 12,922-13,135 ft., total depth. The flow was through ¼-in. choke, under tubing pressure of 2,100 psi.

In Borden County, Castleman & O'Neill completed a ½-mile south extension to Canyon reef production on the west side of the North Vincent area at its 1-B T. L. Griffin, 51-25-H&TC. Completion potential was calculated at 364 bbl. of 42°-gravity oil a day through ¼-in. choke, from open hole from 7,014-28 ft. The extension is ½ mile south of the same operators 1-A Griffin, recently completed 1-mile west extension to the field.

In northwest Martin County, The Texas Co. 1-X State, 17-7-University Lands Survey, recovered 4,000 ft. of 47°-gravity oil on a 3½-hour test in the Ellenburger from 13,110-331 ft. The recovery also had 264 ft. of mud, but no water. Bottom-hole pressure was 1,280 psi. Fifteen minute shut-in pressure was 5,500 psi. On elevation of 2,945 ft., top of the Ellenburger was 13,260 ft.

WEST TEXAS (DISTRICTS 8 AND 7-C) SUCCESSFUL WILDCAT

Runnels County: Kingford Oil Co. 1 L. E. H. Barnett, SW corner R. Christa Sur. 432, 1¾ mi. W Ballinger field, TD 3,069 ft., elevation 1,704 ft., top Canyon sand 3,063 ft., pay 3,064 ft., IP pumped 103 bbl. 43°-gravity oil a day, small GOR.

E. S. Price Oil 1 W. A. Ashton, NW NE Sec. 143, ETRR Sur., 9 mi. NE Ballinger, 3 mi. E Beddo field, TD 4,268 ft., elevation 1,757 ft., Gardner sand 3,774-3,814 ft., perforated 3773-79 ft., IP 428,000 cu. ft. gas a day, ¼-in. choke, shut-in pressure 820 psi.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Crockett County: Dalport Oil Corp. 1 Gulf-Clara Couch, 96-OP-GS&SF Sur., 6 mi. W Ozona, dry, TD 1,098 ft., elevation 2,514 ft.

Jack Holt 1 C. J. Fuller Estate, Sec. 4, Blk. A-3, D. Savages Sur., 10 mi. NW Ozona, dry, TD 1,558 ft., elevation 2,594 ft., San Andres 1,307 ft., swabbed trace of oil at 1,389-1,404 ft.

Ector County: Davis, McDaniel & Beecherl 1 W. L. Bradley, 18-43-3S-T&P, 1½ mi. SW of S end South Cowden field, dry, TD 7,168 ft., elevation 3,057 ft., Grayburg 3,980 ft., San Andres 4,255 ft., Glorietta 5,545 ft., Tubbs 6,785 ft.

Gaines County: Guiberson Oil Corp. 1 R. J. Oil Co., SW NW 22-A22-PSL, 1½ mi. SE Harris field, dry, TD 7,515 ft., elevation 3,218 ft., Yates 2,900 ft., San Andres 4,700 ft., Glorietta 6,080 ft., Clear Fork 6,650 ft. by samples.

Garza County: Clark & Cowden Drilling Corp. 1 Hattie E. Connell, 12-5-GH&H Sur., 6 mi. SE Post, 1½ mi. S production, dry, TD 2,917 ft., elevation 2,403 ft.

Glasscock County: Shell Oil Co. 2 TXL, 23-32-4S-T&P, 10 mi. E Garden City, 4 mi. SE Garden City field, dry, TD 9,801 ft., elevation 2,691 ft., San Angelo 2,690 ft., Clear Fork 2,820 ft., Pennsylvanian 9,027 ft., Mississippian 9,438 ft., Ellenburger 9,646 ft., Fusselman 9,572 ft.

McCulloch County: H. H. Sides 1 B. A. Cornils, H. B. Basson Sur. 594, 2 mi. E, 1½ mi. N Lohn, dry, TD 898 ft. in sand, sulfur water at TD.

Pecos County: Union Oil Co. of California 1 Lulu McGowins, 5-OW-TCRR, 12 mi. NW Fort Stockton, 2½ mi. NW Fort Stockton field, dry, TD 3,800 ft., elevation 2,928 ft., anhydrite 1,740 ft., cored limestone with bleeding oil 2,986-98 ft.

Tom Green County: Sohio Petroleum Co. 1 R. C. Haverland, J. T. Ridgeway Sur. 2, NE corner of county, E of Harriett, dry, TD 4,972 ft., elevation 1,765 ft., Wolfcamp 1,333 ft., Saddle Creek 2,291 ft., Hope 2,507 ft., Gunsight 2,774 ft.,

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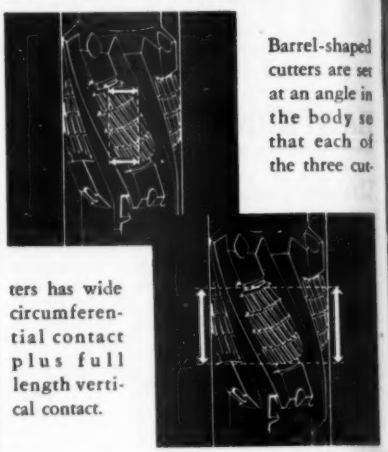

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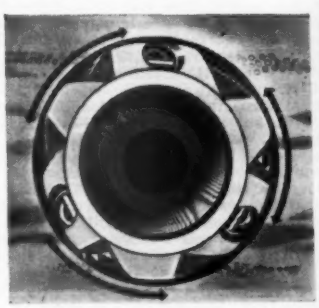

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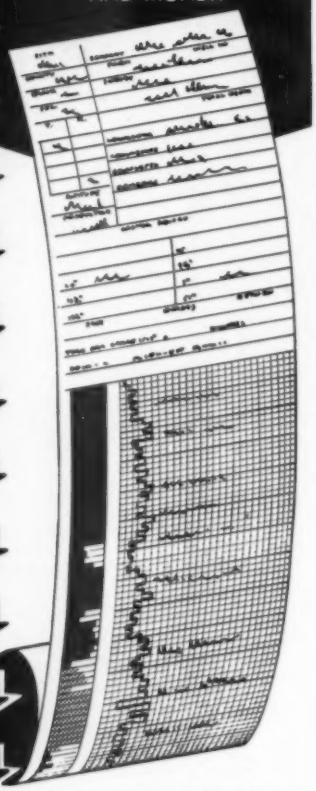

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SOUTHEASTERN NEW MEXICO

HOBBS.—Magnolia Petroleum Co. 1 Lightcap Land Co., prospective Devonian discovery in SE SE 6-8s-30e, Chaves County, had 5½-in. casing set on bottom at 7,978 ft., drilled out to 7,976 ft., ran surveys and perforated casing with 64 shots from 7,960-76 ft. After running tubing, it kicked off and flowed load oil in 3 hours, then flowed 84.8 bbl. of oil in 4 hours through ¼-in. choke. Gravity of the oil was 52.4°, and gas-oil ratio was 1,423 cu. ft. Flowing pressures were 920 psi. on tubing and 1,000 psi. on casing. At last report it was flowing 22 bbl. of oil an hour on completion test. Corrected top on the Devonian was 7,955 ft. Malco Refineries was reported taking the oil.

Union Oil Co. of California 1 State-Fairbairn, Chaves County wildcat in 24-14s-31e, had total depth at 10,065 ft. in limestone, and was rigging up a heavier rig. Top of the Wolfcamp was 8,846 ft., and last drill-stem tests were at 9,380-9,488 ft., open 2 hours, which recovered 340 ft. of slightly gas-cut mud; from 9,972-10,058 ft., 2-hour recovery was 210 ft. of drilling mud with no shows.

Magnolia 1-B Walker, 6-9s-36e, 1½ miles northeast of the Bough field discovery, was coring in lime and shale at 9,903 ft. Good porosity and scattered stains were cored from 9,872-82 ft., and a drill-stem test from 9,832-82 ft. flowed water blanket and mud in 48 minutes, gas in 52 minutes, and mud and oil in 72 minutes. It flowed into pits for 90 minutes, making 44 bbl. of fluid in 1 hour, being 44.8°-gravity oil and 90 per cent salt water.

A drill-stem test from 9,890-9,903 ft., using 2,300 ft. of water cushion, had gas in 66 minutes, and recovered the water blanket plus 4,995 ft. of slightly oil and gas-cut salt water. Flowing pressure was 3,100 psi.

Gulf Oil Corp. 1 Sams-State, 17-15s-33e, 3½ miles southwest of the one-well Saunders field, was drilling below 9,549 ft. in shale and lime following a drill-stem test from 9,218-96 ft. In 1 hour it recovered 60 ft. of drilling mud, with no pressure. Top of the Pennsylvanian was around 9,225 ft. on elevation of 4,221 ft.

SOUTHEAST NEW MEXICO WILDCAT FAILURES

Lea County: James D. Irwin 1 State-Phillips, NE SE 26-17s-33e, 3 mi. E Maljamar field, dry, TD 4,692 ft., elevation 4,142 ft., Yates 2,820 ft., Queen 3,810 ft., San Andres 4,595 ft.

V. P. Sheldon 1 Amerada-State, SW SE 13-21s-33e, dry, TD 4,018 ft., elevation 3,761 ft., Yates 3,560 ft.

OHIO FIELDS

Rank Wildcat Test Finds Production

COLUMBUS.—Willard Shrider et al., 2 H. L. Ringwalt, Third Quarter, New Castle Township, Coshocton County, the first producer to be completed in the township in recent years, may open a new area of activity. The Clinton sand at 3,245-96 ft. filled 2,000 ft. natural, and swabbed 65 bbl. of oil in 24 hours after shot.

Frank Brendel Oil & Gas Co. completed two wells in Perryton field. The 2 Alva Fairall, Section 7, Jackson Township, Muskingum County, drilled the Clinton at 3,182-3,242 ft. with a good oil showing, natural, and made 80 bbl. in 24 hours after a 240-qt. shot. The 3 Alva Fairall, with sand at 3,123-90 ft., gaged 800,000 cu. ft. of gas, natural, but blew down to 500,000 cu. ft. and 12 bbl. of oil after shot.

Frank Lyons et al., struck an oil producer in their first test in Trenton field, at J. Brown, Section 33, Crane Township, Wyandot County. The Trenton was topped at 1,354 ft. and drilled to 1,391 ft. The well

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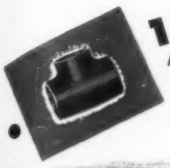

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is reported as making 10 bbl. an hour with an estimated gage of 500,000 cu. ft. of gas.

West States Petroleum Corp. has taken a large block of acreage in Perry Township, Putnam County, and is drilling a wildcat to test the sub-Trenton on R. J. Merriott, Section 17, just south of the town of Dupont.

OKLAHOMA

Wilcox Sand Pool Opened By Grant County Wildcat

DAVON OIL CO. appears to be opening another Wilcox sand pool in southeastern Grant County at its 1 Kelley, SW SW SW 27-25n-4w. With casing perforated at 6,000-45 ft., and the zone given a Hydrafrac application, the well kicked off, and after unloading was flowing by heads at the rate of 4 bbl. of oil per hour.

Electric log showed the top of the first Wilcox at 6,027 ft. with surface elevation at 1,082 ft. Hole was drilled to a total depth of 6,168 ft. in second Wilcox, topped at 6,068 ft. Casing (5½-in.) was run to 6,158 ft. and hole plugged back to 6,045 ft. for the perforations.

The discovery, located southwest of Salt Fork, nearest town, is about 5 miles northeast of the Northwest Hunter pool and about the same distance southeast of the Rich Valley pool, nearest production. Both of these pools, opened last year, produce from the Wilcox sand. The latter also produces from the Marshall zone.

A second producing formation, the Layton sand, is in prospect for the Northeast Lamont pool, also in southeastern Grant County. Kingwood Oil Co. 1 Morrill, NE SW NW 22-26n-3w, about ⅜ mile northeast of the pool's discovery and so far only producing well, got 1,350 ft. of gas-cut mud and 130 ft. of heavily oil-cut mud in a drill-stem test of that sand at 3,849-54 ft. Casing has been run to the top of the pay for production tests. The discovery well, Anderson-Prichard Oil Corp. 1 Hamburg, NE NE SE 21-26n-3w, produces from the Mississippian at 4,850-4,905 ft. It was completed last year. This pool is about 9 miles northeast of the Davon Oil Co. discovery.

Calvert & Mee and Newt Barrett found good oil and gas showings in Wilcox sand at their 1 State, NE NW SE 2-10n-4e, a wildcat located about 4 miles east and 2½ miles north of Shawnee, Pottawatomie County. Wilcox sand was topped at 4,869 ft. Total depth is 4,878 ft. with 5½-in. casing cemented at 4,852 ft. Two drill-stem tests were made, The first, at 4,867-78 ft., got 45 ft. of heavily oil and gas-cut mud. The second, taking in an additional foot of pay at the top, yielded 270 ft. of mud and 150 ft. of heavily oil and gas-cut mud. No water was indicated. Showings previously had been obtained in the Lower Earlsboro sand, logged at 4,055-4,117 ft.

Denver H. Daugherty and Ralph W. Casey have a Fed Fork sand discovery in their 1 Oller-Rummage, NE NE SW 17-19n-8e, 6½ miles northeast of Oilton, in Creek County. With sand at 2,537-42 ft., the well flowed by heads about 16 bbl. of oil per hour through ½-in. choke. It is in the East Cushing producing district, but is more than a mile from nearest production.

The Texas Co. 2 Watson, SE NE NW 9-12n-3e, which opens a new Red Fork sand pool 5½ miles northwest of Meeker, Lincoln County, produced 40 bbl. of 35° gravity oil in an 8-hour swabbing test. No water was indicated. A Hydrafrac application will be made in an effort to improve production. Sand is open at 4,694-4,709 ft.

A new pay zone and an extension for the Happy Valley pool in northern Lincoln County is being proved at Comail Oil Co. 1-A Haskin, SW SW SW 19-17n-6e. The new zone is the Prue sand, in which casing was perforated at 2,940-58 ft. The well flowed 86½ bbl. of oil and an estimated 3,000,000 cu. ft. of gas in the first 24 hours. Total depth is 3,401 ft. Its location is northeast of production.

OKLAHOMA SUCCESSFUL WILDCATS

Lincoln County: Waggoner & Williams and H & H Supply 1 Kolar, SE SE NW 27-12n-6e, pumped 9 bbl. of 34°-gravity oil per day from Prue at 3,217-36 ft., TD 4,515 ft., Checkerboard 2,170 ft., Oswego 3,050 ft., Skinner 3,280 ft., lime 3,500 ft., Red Fork 3,560 ft., sand 3,595 ft., Bartlesville 3,645 ft., lime 3,818 ft., Pennsylvanian Caney 3,970 ft., Mississippian Caney 4,000 ft., Mayes 4,218 ft., Woodford 4,350 ft., Hunton 4,390 ft., Sylvan 4,512 ft.

Payne County: Kingwood Oil Co. 1 Murphy, SW SW SE 28-18n-1e, pumped 63 bbl. of 38°-gravity oil per day from Bartlesville at 4,782-4,816 ft., TD 4,829 ft., Deer Creek 1,895 ft., Avant 3,099 ft., Dewey 3,243 ft., Hogshooter 3,790 ft., Layton 3,826 ft., Checkerboard 4,104 ft., Cleveland 4,230 ft., Big lime 4,344 ft., Oswego 4,404 ft., Verdigris 4,571 ft., Skinner 4,590 ft., lime 4,687 ft.

OKLAHOMA WILDCAT FAILURES

Grant County: Nichols-Duncan Drilling Co. 1 Barr, NE NE NE 31-26n-7w, dry, TD 6,303 ft., Layton 4,570 ft., Checkerboard 4,845 ft., Oswego 4,965 ft., Mississippi chat 5,370 ft., Mississippi lime 5,412 ft., Woodford 5,963 ft., Sylvan 6,035 ft., Viola 6,105 ft., dolomite 6,132 ft., first Wilcox 6,168 ft., second Wilcox 6,210 ft.

Lincoln County: Schonwald 1 Breeder, NE SE SE 33-17n-3e, dry, TD 4,815 ft., Big lime-Oswego 3,820 ft., Inola 4,132 ft., Bartlesville 4,164 ft., lime 4,328 ft., Mississippi lime 4,380 ft., Woodford 4,500 ft., Hunton 4,547 ft., Sylvan 4,566 ft., Viola 4,666 ft., first Wilcox 4,722 ft., second Wilcox 4,788 ft.

Marshall County: King, Terrell & Graves 1 Ancatubby, NW NW NE 25-6s-5e, dry, TD 1,042 ft., in Woodford.

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Pawnee County: Deardorf Oil Co. 1 Frances, NW NW NW 14-22n-6e, dry, TD 3,125 ft., Avant-Dewey 1,602 ft., Layton 1,720 ft., Oswego 2,385 ft., upper Skinner 2,653 ft., lower Skinner 2,680 ft., lime 2,702 ft., Mississippi lime 2,890 ft., Woodford 3,050 ft., Wilcox 3,081 ft.

Payne County: Johnson Oil Refining Co. 1 Griffith, NW NW SE 13-17n-5e, dry, TD 3,605 ft., Checkerboard 2,380 ft., Oswego 2,905 ft., Prue 3,031 ft., Verdigris 3,100 ft., no Skinner, lime 3,260 ft., Red Fork 3,310 ft., Inola 3,393 ft., no Bartlesville, lime 3,510 ft., Mississippi lime 3,594 ft.

Midco Oil Corp. 1 Wilson, SE SE NE 14-17n-5e, dry, TD 3,475 ft., lime 3,275 ft., Inola 3,403 ft., Bartlesville 3,437 ft., no sand.

Tillman County: Johnson 1 Fryer, NE NE SW 10-2s-17w, dry, TD 4,758 ft., Canyon lime 3,004 ft., Arbuckle 4,741 ft.

KANSAS

Morel Pool Area Gets Another Producing Spot

DISCOVERY of another productive spot in active Morel area in southeastern Graham County appears to have been made by Willis L. Hartman at his 1 Martin-Webster, NE NE NE 9-10-21. With oil and gas showings in both the Arbuckle and the Lansing-Kansas City, the well now has casing run for testing. Location of this discovery, ½ mile northeast of the Teall pool (nearest production), is about 3 miles south of the Morel pool. Within recent months, the Morel and West Morel pools have been almost circled with new discoveries.

Arbuckle in this latest discovery was topped at 3,834 ft. (—1,574 ft.). Hole was drilled with rotary to 3,840 ft. Casing was run to 3,836 ft. (2 ft. in the top). This prospective pay zone will be tested first. Lansing was topped at 3,502 ft. Most prospective zone was at 3,679-3,709 ft., where a 20-minute drill-stem test resulted in a good show of gas and yielded 1,180 ft. of 38° oil.

Deep Rock Oil Corp. 1 Stoddard, SW SW SW 17-31-8, 1½ miles southeast of the Grabs pool, northwestern Harper County, is drilling ahead for a look at the Arbuckle following a series of drill-stem tests through the upper part of the Mississippian, topped at 4,391 ft. (—2,755 ft.). First test was at 4,390-4,401 ft. with tester open 1 hour. In this, gas was at the top within 1 minute and after 45 minutes was flowing at the rate of 2,000,000 cu. ft. per day. Flow pressure was 430 psi. and indicated bottom-hole pressure 1,550 psi. Recovery was 210 ft. of gas-cut mud. Second test, taking in an interval at 4,400-16 ft., resulted in a gas flow gaged at the rate of 887,000 cu. ft. per day and a recovery of 142 ft. of oil and gas-cut mud, plus 50 ft. of water. The third test, at 4,416-31 ft., yielded 180 ft. of heavily oil and gas-cut mud. In the fourth test, at 4,431-51 ft., 300 ft. of oil and gas-cut mud, 135 ft. of oil and 45 ft. of water was recovered. The final test was at 4,451-81 ft. with a recovery of 210 ft. of gas-cut mud and 540 ft. of water.

Reserve Drilling Co. has completed its 1 Kern, NW NW SW 28-9-20, southwestern Rooks County wildcat, with a potential of 3,000 bbl. per day (maximum). Production is from Arbuckle lime at 3,855-59 ft. (—1,578-82 ft.). This new area is a mile west of production of the Northhampton pool.

Alpine Oil & Royalty Co. and Bradley Brothers have completed their 1 Rusco, SW SW SE 8-19-12, 6 miles north of Great Bend, Barton County, pumping 25 bbl. of net oil daily from Arbuckle lime, topped

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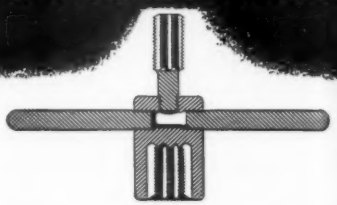

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at 3,417 ft. (—1,550 ft.), and open at 3,418-42 ft. It opens the Rusco pool. Location is 3 miles west of the Cheyenne View pool.

An effort to extend the Central Kansas Uplift trend to pools northward into southern Nebraska is being made by Alpine Oil & Refining Co. and B. & R. Drilling Co. which are starting a test in southern Harlan County of that state. Location of the test, 1 Fischer, in SW SW SE 33-1n-18w, is just across the Phillips County, Kansas, line, and about 5½ miles north and slightly east of the Huffstetter pool, that county. The latter pool currently is the northernmost of the Central Kansas pools.

KANSAS SUCCESSFUL WILDCATS

Barton County: Duke & Wood 1 Wondra, SE SE SE 4-17s-12w, pumped 286 bbl. of oil per day from Arbuckle topped at 3,322 ft., TD 3,328 ft.

Henderson 1 Jordan, SW SW SE 8-18s-11w, pumped 47 bbl. of oil per day from Arbuckle at 3,369-80 ft., TD 3,381 ft.

KANSAS WILDCAT FAILURES

Barton County: Chalmette 1 Harmison, SE SE SW 17-17s-13w, dry, TD 3,450 ft., Arbuckle 3,422 ft.

Huber et al., 1 Laubic, SW SW NE 6-16s-11w, dry, TD 3,395 ft., Heebner 2,918 ft., Lansing-Kansas City 3,025 ft., Arbuckle 3,341 ft.

Cowley County: Herndon 1 Hunt, SE SE NW 16-34s-1e, dry, TD 4,006 ft., Mississippi lime 3,667 ft., Kinderhook 3,950 ft.

Graham County: Peel-Hardman et al., 1 Van loenen, NE NE SW 19-9s-21w, dry, TD 3,929 ft., basal Kansas City 3,834 ft., Arbuckle 3,942 ft.

Harvey County: Ash 1 Herschberger, NE NE SW 36-22s-1w, dry, TD 3,133 ft., Lansing-Kansas City 2,353 ft., Mississippi lime 3,012 ft.

Marion County: Allison 1 Goering, C NL NW NE 27-21s-3e, dry, TD 2,905 ft.

Reno County: Huber et al., 1 Sigg, NE NE SW 34-26s-4w, dry, TD 4,290 ft., Arbuckle 4,245 ft.

Rice County: Heathman 1 Schmidt, SW NW SE 28-18s-8w, dry, TD 3,643 ft., Heebner 2,729 ft., Lansing-Kansas City 2,886 ft., Maquoketa 3,264 ft., Viola 3,311 ft., Simpson 3,373 ft., Arbuckle 3,438 ft.

Rooks County: Sidey 1 Nelson, SE NW SW 34-10s-16w, dry, TD 3,626 ft., no tops released.

Gore 1 Ross, NW NW NW 12-10s-18w, dry, TD 3,796 ft., Heebner 3,338 ft., Lansing-Kansas City 3,382 ft., Arbuckle 3,765 ft.

Sedgwick County: Hinton (corr.) 1 Uhbrick (corr.) SE SE SW 5-25s-2e, dry, TD 3,515 ft., Lansing-Kansas City 2,488 ft., Mississippi lime 2,960 ft., Kinderhook 3,260 ft., Hunton 3,324 ft., Viola 3,392 ft., Simpson 3,418 ft., Arbuckle 3,489 ft.

Gaty 1 Coleman, SW NE NW 32-26s-2e, dry, TD 3,009 ft., in Mississippi lime.

Wabaunsee County: Sanderson et al., 1 Converse, NW NW NW 35-14s-10e, dry, TD 3,401 ft., Mississippi chert 2,610 ft., Kinderhook 2,948 ft., Hunton 3,094 ft., Maquoketa 3,205 ft., Viola 3,276 ft., Simpson 3,383 ft.

ILL.-IND.-KY.

Lawrence County Wildcat Shows for Oil Production

HALL EDWARDS has uncovered what appears to be another productive area in Lawrence County, Illinois, at his 1 Hinton, NW SW NW 5-2n-12w. Located a mile north of the Ruark pool, nearest production, the well found good showings of oil in the O'Hara lime. A drill-stem test at 2,230-35 ft. in this pay yielded 170 ft. of clean oil, 50 ft. of mud-cut oil and 120 ft. of water. Hole was drilled to a total depth of 2,305 ft. after which 5½-in. casing was run through the O'Hara to 2,271 ft. Casing will be perforated in the above zone.

Tom M. Pruitt has completed his 1 Norris-Weisbrodt, NW SE NW 7-9s-3e, first commercial producer for Williamson County, Illinois. Producing from Aux Vases sand at 2,389-95 ft., the well is pumping about 25 bbl. of oil daily. The well is about a half-mile north of Marion, county-seat. Nearest production is in the Southwest Frankfort pool, about 8 miles to the north. Williamson County is near the south end of the state.

Indiana has a prospective new pool at C. E. Skiles and associates 1 Sievers, NW SE SE 22-1n-7w, 6 miles east of Petersburg, Pike County, where testing of showings found in Cypress sand is under way. Good saturation and porosity were logged at 1,028-38 ft. and 1,040-46 ft. Bottom of the hole is in McCloskey lime at 1,297 ft. Located about ½ mile north of Algeris, this discovery is some 2½ miles from nearest production. It is the area north of the Iva oil pool and west of the East Iva gas field.

A new pay zone and a southeastward extension for the North Princeton area, a mile east of Princeton, Gibson County, Indiana, are indicated by showings encountered in Johnny Cline and associates 1 Gieselman, SW NW NW 9-2s-10w. Showings were in Cypress sand at 1,795-1,803 ft., where a drill-stem test, with tool open 60 minutes, yielded 280 ft. of clean oil, 200 ft. of oil-cut mud and 30 ft. of water. At total depth of 1,803 ft., the well still was in sand. Casing has been run to 1,798 ft. for completion.

The recently opened South Oliver area, 6 miles north of Mt. Vernon, Posey County, Indiana, is getting its best well to date at Superior Oil Co. 1 Kaffenberger, SE NW SE 10-6s-13w. The well is pumping and flowing about 530 bbl. of oil daily following a 4,000-gal. acid treatment of the pay zone, Aux Vases lime, in which casing was

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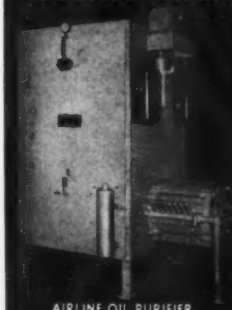

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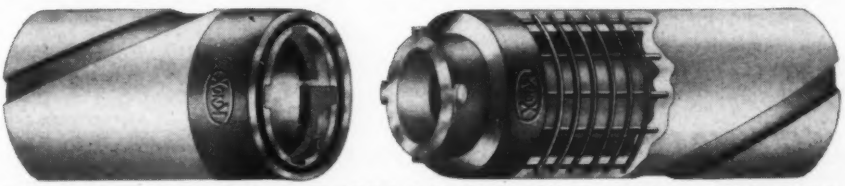

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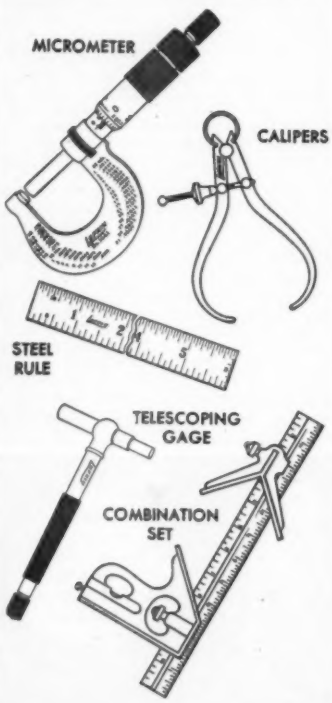

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perforated at 2,761-69 ft. Total depth of 2,893 ft. with 7-in. casing at 2,812 ft.

McMahan and associates 2 Wilhite, 17-N-28, which taps a new producing reservoir on the east side of the Guffie pool, northern McLean County, western Kentucky, is pumping about 7 bbl. of oil per hour while testing. Pay zone is Tar Springs sand in which hole is open at 1,679-90 ft. Sand was logged from 1,674 ft.

Columbus Exploration Co. appears to have an exceptionally good well for the Whittington area, Franklin County, Illinois, at its 1 Alva Cook, Jr., SE SE SW 21-5s-3e, which swabbed and flowed at the rate of 30 bbl. of oil per hour while testing McClosky lime. The well not only extends production ¾ mile eastward but also opens a new pay horizon. McClosky saturation is at 2,916-21 ft. and 2,928-45 ft.

ILLINOIS SUCCESSFUL WILDCAT

Williamson County: T. M. Pruitt 1 Norris-Weisbrogt, NW SE NW 7-9s-3e, IP 25 bbl., Aux Vases sand 2,389-95 ft., TD 2,560 ft.

ILLINOIS WILDCAT FAILURES

Bond County: National Associated Petroleum Co. 1 Potthast, SW NE SE 32-5n-3w, dry, TD 1,279 ft.

Clark County: Aberdeen Petroleum Co. 1 Hilbert, SE NE NE 22-10n-11w, dry, TD 2,500 ft.

W. Camp et al., 1 Smutley, SE SE NW 7-11n-11w, dry, TD 2,385 ft.

Clay County: George & Wrather et al., 1 Harrison et al., NW SE NE 10-3n-5e, dry, TD 3,000 ft.

Edgar County: National Associated Petroleum Co. and Continental Oil Co. 1-C J. D. Martin, NW SE NW 5-12n-11w, dry, TD 1,052 ft.

Effingham County: E. H. Kaufman 1 Haack, NE NE NW 22-8n-6e, dry, TD 2,502 ft.

Jasper County: Indiana Farm Bureau 1 Parr, NE NW NE 13-7n-10e, dry, TD 2,559 ft.

Lawrence County: Nation Oil Co. 1 Gerhart, NE NE NW 1-3n-11w, dry, TD 1,814 ft.

Macoupin County: R. Updike 1 Kay, SW SE NW 32-7n-8w, dry, TD 468 ft.

Marion County: W. O. Schock 1 Heflin, SW NE SW 12-1n-3e, dry, TD 2,844 ft.

Wabash County: C. E. Brehm 1 Kerwin, NW NE SW 16-3s-14w, dry, TD 3,075 ft.

INDIANA SUCCESSFUL WILDCAT

Sullivan County: F. B. Cline 1 Ogle, NE NE SW 32-8n-9w, IP 14 bbl., Pennsylvanian sand 680-87 ft., TD 687 ft.

INDIANA WILDCAT FAILURES

Cass County: Huff Brothers 2 Beauchamp, SW SE SW 14-28n-1w, dry, TD 960 ft.

Clay County: George Schoonmaker 1 Buell, SW SE SE 20-12n-7w, dry, TD 1,584 ft.

Daviess County: B.L.S. Drilling Co. 1 Bell, SW NW SE 1-4n-6w, dry, TD 716 ft.

Gibson County: Aurora Gasoline Co. et al., 1 McConnell, SE SE NE 31-2s-12w, dry, TD 2,700 ft.

Joe Reznik 1 Benton Community, NW SW SE 15-2s-11w, dry, TD 2,352 ft.

Posey County: John Buchman 1 Seibert, NE NE SW 23-4s-12w, dry, TD 2,700 ft.

EASTERN KENTUCKY

ASHLAND.—One of the largest wells in several years in Eastern Kentucky is now in the testing stage and bids fair to make a good producer.

United Carbon Co. 4 E. J. Evans, 1-M-77, Breathitt County, is pumping at the rate of approximately 250 bbl. per day from Big Lime (Mississippian). Top of formation is reported at 1,165 ft. with hole bottomed at 1,377 ft. in red rock. New production is 3½ miles south of Howard Creek gas pool currently producing from the Bix Six (Silurian) sand.

In Fleming County, 20-V-70, Walter Kline et al are drilling slowly ahead at 1,534 ft. in the Knox dolomite. Hard formation and light drilling tools are causing slow progress. No shows have been reported. This test, 1 James Bashford, is only the third well in entire county to reach the Knox formation. Previous tests were dry.

LEGAL

Approximately 527 ACRES of allotted Indian lands located within the jurisdiction of the Uintah and Ouray Indian Reservation, in Townships 9 and 10 South, Range 2E East, are being advertised for lease, bids on which will be opened June 9, 1950, at 2:00 P.M., at the office of Forrest R. Stone, Superintendent, Uintah and Ouray Agency Fort Duchesne, Utah. Full particulars may be obtained from Superintendent Stone or from Mr. J. R. Schwabrow, U. S. Geological Survey, Federal Building, Casper, Wyoming.

LEGAL

OIL DRILLING EQUIPMENT AT PUBLIC AUCTION

The undersigned, as liquidating receiver of the Carroll Drilling Corporation, a Kentucky corporation, will sell the following described property at public auction to the highest bidder at the front door of the Fayette County Court House in the City of Lexington, Kentucky, at twelve o'clock noon, central daylight saving time, on Saturday, June 17, 1950, on a credit of three months with the privilege of paying all cash, the purchasers being required to execute bonds with good surety thereon bearing interest from the date of sale, to-wit: 1. The following property located on the Collins lease in Madison County, Kentucky, said location being approximately five (5) miles west of Million, Kentucky, and ten (10) miles northwest of Richmond, Kentucky, and said location being also known as the California Company deep test well, to-wit: 1—36-L Bucyrus-Erie Drilling Machine, with 6 cylinder Buda gas, gasoline motor equipped for Butane fuel, complete with catheads, crane, 500 feet of Non-rotation casing line, 3 sheave casing block, 5 inch casing hook, Ram attachments, cat line, Derrick floor and sills, Derrick floor shed, with lots of extra sheet metal roofing, Guy lines, stakes and Turnbuckles, with all tools and fittings now located at the machine. 2. Located on the Burchell lease in Clinton County, Kentucky, near Seventy Six Post Office, approximately eight (8) miles northeast of Albany, Kentucky, to-wit: 1—36-L Bucyrus-Erie Drilling machine, with 6 cylinder gas, gasoline Waukesha sleave motor, complete with catheads, Crane, 500 feet of Non-rotating casing line, 3 sheave casing block, 5 inch casing hook, ram attachments, cat line, derrick floor and sills, derrick floor shed, Guy lines, stakes, and turnbuckles, with all tools and fittings now located at the machines. 3. Located on the Bush-White Heirs lease in Wolfe County, Kentucky, near Standing Rock, Kentucky, approximately fifteen (15) miles north of Beattyville, Kentucky, to-wit: 1—24-L Bucyrus-Erie Drilling machine, with 6 cylinder Buda gas, gasoline motor, complete with catheads, Crane, ¾ inch casing line, single sheave casing block, casing hook, Guy lines, stakes, turnbuckles, cat line, and derrick floor, with all tools and fittings now located at the machines. 4. Located on the Treadway Heirs lease in Lee County, Kentucky, on dividing ridge between Ross' creek and waters of Sturgeon Creek, near Arvel, Kentucky, which is fifteen (15) miles southwest of Beattyville, Kentucky, to-wit: 1—24-L Bucyrus-Erie Drilling machine, with 6 cylinder Buda gas, gasoline motor, complete with catheads, Crane, ¾ inch casing line, single sheave casing block, casing hook, Guy lines, stakes, turnbuckles, catline, and derrick floor, with all tools and fittings now located at the machine. 5. Located on the Tribue Heirs lease in Lee County, Kentucky, on dividing ridge between Ross' Creek and waters of Sturgeon Creek, near Arvel, Kentucky, which is fifteen (15) miles southwest of Beattyville, Kentucky, to-wit: 1—5½" Keystone "Joplin Special" Drilling machine with calf wheels, and plenty of tools to drill with. 6. Located on the Murley lease in Cumberland County, Kentucky, seven (7) miles southwest of Burksville, Kentucky, in what is known as Walsh's Bottom; also known as the California Company deep test well in Cumberland County, Kentucky, to-wit: 6,000 feet of new ⅞ inch American 6x19 Drilling cable. 4,000 feet of slightly used 9/16 inch sand line. 1—5¼" x 30' drilling stem, with 4¼" box, and 3¾" pin. 1—set 6½" drilling jars with 4¼" box, and 4¼" pin. 1—9" bailer. 1—7" bailer. 7. 1 Army 6x6 G. I. truck (Studebaker) with winch. 8. 1—1947 Ford truck with winch and Leland oil field bed. 9. 1 Army trailer, on the Tribue Heirs lease, in Lee County, Kentucky. 10. 1—1950 Ford Tudor sedan. The property to be sold may be inspected at the several locations above mentioned at any time prior to the sale. R. J. COLBERT, Liquidating Receiver of Carroll Drilling Corporation.

Completions Gain 5.2 Per Cent, Footage 8 Per Cent, So Far This Year

by Polly DeArmond

OPERATORS drilled 12,529 wells and 47,195,095 ft. during the first 4 months of this year. These cumulative totals represent gains of 645 completions, or 5.2 per cent, and 3,774,969 ft., or 8 per cent, over the comparable period of last year. Average depth of wells drilled was slightly higher, figuring 3,767 ft. this year against 3,654 ft. in 1949.

Projected Totals

Usually completions for January through April of any year will average approximately 30 per cent of the annual tabulation, while footage is generally 31 per cent of the grand total. If these ratios are used to arrive at an early estimate of activity for 1950, some 41,200 wells and 150,000,000 ft. will be drilled. This would be 3,786 wells and 12,000,000 ft. more than forecast at the beginning of the year. *(See The Oil and Gas Journal, January 26, 1950.)* However, economic trends may indicate that the 4-month completions will reflect a higher-than-average percentage of the total year.

Increases

The central sections of the country accounted for the over-all increases during the period. The Mid-Continent division of Oklahoma-Kansas-Nebraska contributed the greatest gains percentagewise: up 619 wells (22.3 per cent) and 1,920,077 ft. (20.2 per cent). Texas and New Mexico noted gains of 855 completions, or 16.1 per cent, and 3,368,429 ft., or 14.7 per cent. The Southern states (Arkansas, Louisiana, Mississippi, Alabama, Georgia, and Florida) reported 142 more wells, or 13.9 per cent, and 862,877 additional feet, or 14.5 per cent, compared with last year.

Decreases

Operations in the Appalachian area have decreased steadily for the past year and a half. This section, including New York, Pennsylvania, and West Virginia, dropped 508 wells, or 63.2 per cent, and 796,710 ft., or 53.4 per cent, in comparison with figures for the 4 months in 1949. Deeper drilling was indicated for the Pacific Coast which showed a decline of 52.9 per cent in wells against a 29 per cent loss in footage (off 297 completions and 747,862 ft.). The Rocky Mountain region, made up of Montana, Wyoming, Colorado, Utah, and Idaho, fell 48 wells, or 19.4 per cent, and 213,644 ft., or 19.9 per cent. Shallower holes were finished in the North Central states (Ohio, Indiana, Kentucky, Illinois, and Michigan), which noted a decrease of 118 completions, or 6.5 per cent, with an accompanying 16.4 per cent decline of 618,198 ft.

Immediate Prospects

The number of rotary rigs is about the same as last year, and with more wells being completed per rig, slight gains in drilling activity will continue for the next couple of months.

SUMMARY OF COMPLETIONS, APRIL 1950

	Total comp.	Oil	Gas	Dry	Under 2,500 ft.	2,500-5,000 ft.	5,000-7,500 ft.	7,500-10,000 ft.	10,000-12,500 ft.	Over 12,500 ft.	Total footage	Rigs and drilling
New York	42	21	0	21	42	0	0	0	0	0	61,000	§57
Pennsylvania	106	49	18	39	95	11	0	0	0	0	185,980	231
West Virginia	41	10	20	11	23	13	5	0	0	0	107,412	¶155
Ohio	72	26	20	26	38	34	0	0	0	0	158,422	117
Indiana	85	30	1	54	70	15	0	0	0	0	155,553	185
Kentucky	88	40	14	34	71	17	0	0	0	0	154,497	71
Illinois	144	55	0	89	66	78	0	0	0	0	333,561	264
Michigan	63	29	2	32	41	22	0	0	0	0	143,765	129
Kansas	273	153	19	101	49	223	1	0	0	0	913,855	385
Neb., Mo., Iowa	3	1	0	2	0	3	0	0	0	0	12,158	12
Oklahoma	435	252	11	172	143	204	75	9	4	0	1,511,603	740
Texas	1,247	849	35	363	359	420	365	84	16	3	5,314,865	1,598
North	263	160	1	102	134	86	43	0	0	0	792,326	196
West Central	159	78	4	77	68	81	10	0	0	0	467,490	165
West	363	316	0	47	51	85	188	30	7	2	1,948,373	676
Panhandle	61	42	11	8	2	58	1	0	0	0	183,825	101
East	89	66	5	18	30	40	12	7	0	0	328,155	81
Gulf Coast	164	102	10	52	24	29	65	38	7	1	977,465	223
Southwest	148	85	4	59	50	41	46	9	2	0	617,231	156
Louisiana	180	109	18	53	57	24	35	25	33	6	1,069,963	237
Northern	105	63	13	29	56	21	19	6	3	0	375,106	72
Southern	75	46	5	24	1	3	16	19	30	6	694,857	165
Arkansas	30	19	0	11	7	20	0	3	0	0	101,542	36
Mississippi	35	14	2	19	1	2	14	11	7	0	267,547	32
Ala., Ga., Fla.	6	1	0	5	1	4	1	0	0	0	22,122	6
Montana	19	11	2	6	13	5	1	0	0	0	44,954	55
Wyoming	41	32	0	9	2	22	13	2	2	0	206,557	‖114
Colorado	4	0	0	4	2	1	1	0	0	0	10,810	22
Utah	0	0	0	0	0	0	0	0	0	0	0	15
New Mexico	45	33	4	8	7	24	7	2	4	1	214,735	**122
California	133	92	1	40	39	53	22	12	4	3	579,534	284
Idaho	3	0	0	3	2	1	0	0	0	0	7,108	4
Total April 1950	3,095	†1,826	167	*1,102	1,128	1,196	540	148	70	13	11,577,543	‡4,871
Total March 1950	3,417	2,009	222	1,186	1,198	1,325	610	203	71	10	12,952,782	4,560
Total April 1949	3,095	1,753	246	1,096	1,141	1,282	412	167	77	16	11,346,215	4,805
Cumulative 1950	12,529	7,312	798	4,419	4,428	5,006	2,085	665	298	47	47,195,095	
Cumulative 1949	11,884	6,787	834	4,263	4,317	4,884	1,613	724	305	41	43,420,126	....

*Incl. 85 service wells: N. Y. 21, Pa. 38, Ohio 3, Ind. 1, Ky. 2, Kans. 6, Okla. 7, N. Tex. 2, W. Cen. Tex. 1, W. Tex. 2, SW Tex. 1, N. La. 1. †Incl. 24 distillate wells: Okla. 1, E. Tex. 2, Tex. Gulf 4, N. La. 5, S. La. 7, Miss. 5. ‡Incl. all wells rigged up and/or drilling at end of month. §Incl. 2 Md. ¶Incl. 2 Va. ‖Incl. 3 Dakotas. **Incl. 5 Ariz.

XUM

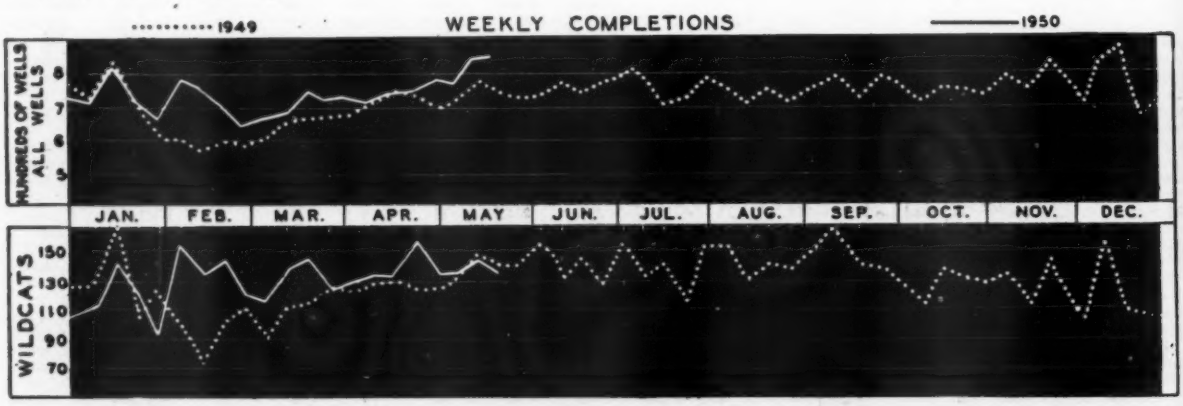
CURRENT STATISTICS

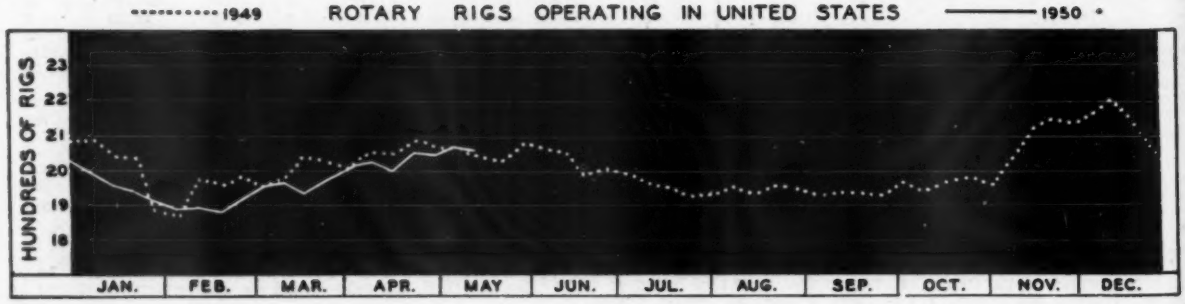
EXPLORATION

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MAY 20, 1950

	Total of all wells					May 20		Wildcat completions and discoveries					Cumulative total, 1950				
	Comp.	Oil	Gas	Dry	Footage	1950	1949	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	7	4	0	*3	8,491	175	504	0	0	0	0	0	0	0	0	0	0
Pennsylvania	16	7	4	5	38,314	389	798	0	0	0	0	0	0	0	0	1	1
West Virginia	17	4	9	4	40,718	237	195	0	0	0	0	0	0	0	7	9	16
Ohio	15	6	6	3	29,179	343	435	0	0	0	0	0	1	0	1	6	8
Indiana	37	13	1	23	61,764	456	446	1	0	0	6	7	13	0	1	82	96
Kentucky	14	5	4	†5	30,013	323	333	0	0	0	0	0	6	0	1	25	32
Illinois	62	25	0	37	131,079	856	816	1	0	0	11	12	14	0	0	197	211
Michigan	20	10	0	10	33,057	277	328	1	0	0	2	3	13	0	3	96	112
Kansas	65	32	6	†27	214,224	1,351	1,143	2	0	0	13	15	31	0	2	205	238
Nebraska	5	3	1	1	21,751	30	13	0	0	0	1	1	0	0	1	13	14
Oklahoma	102	58	11	*33	358,548	1,974	1,567	2	0	0	8	10	58	5	8	247	318
Texas	345	227	11	107	1,524,758	5,880	5,095	15	1	2	51	69	185	13	44	915	1,157
North Central (Dist. 7-B & 9)	104	53	0	51	307,713	1,828	1,634	8	0	0	21	29	71	2	11	333	417
West (Dist. 7-C & 8)	104	88	1	†15	551,390	1,720	1,139	1	0	1	10	12	43	1	1	191	236
Panhandle (Dist. 10)	22	14	6	2	66,267	376	394	0	0	0	0	0	1	0	2	8	11
Eastern (Dist. 5, 6, & 6-P)	27	21	0	6	105,560	415	371	2	0	0	2	4	7	1	1	83	92
Gulf Coast (Dist. 2 & 3)	47	32	2	13	296,127	802	741	2	1	1	7	11	32	5	16	124	177
Southwest (Dist. 1 & 4)	41	19	2	20	197,701	739	816	2	0	0	11	13	31	4	13	176	224
Louisiana	54	37	7	10	339,939	890	762	2	0	0	3	5	24	7	4	71	106
Northern	28	18	6	4	107,144	459	386	0	0	0	0	0	4	0	1	28	33
Southern	26	19	1	6	232,795	431	376	2	0	0	3	5	20	7	3	43	73
Arkansas	10	6	0	4	35,072	138	117	0	0	0	3	3	2	0	0	34	36
Mississippi	9	6	0	3	57,200	127	145	0	0	0	2	2	7	2	0	45	54
Southeastern States	4	1	0	3	17,424	26	20	0	0	0	2	2	0	0	1	17	18
Montana	17	10	3	4	34,045	65	78	1	0	0	0	1	1	0	0	9	10
Wyoming	11	8	1	2	44,655	207	212	1	0	0	0	1	7	0	0	23	30
Colorado-Utah	1	0	1	0	5,618	21	42	0	0	0	0	0	0	0	0	17	17
New Mexico	11	6	2	3	44,373	246	217	0	0	0	2	2	8	0	0	22	30
California	23	18	1	4	123,774	639	1,011	0	0	0	2	2	10	0	2	129	141
Miscellaneous	0	0	0	0	0	6	13	0	0	0	0	0	0	0	0	6	6
Total United States	845	486	68	291	3,193,996	14,656	14,290	26	1	2	106	135	380	27	75	2,169	2,651
Total previous week	842	470	58	314	3,084,065	....	....	27	2	1	114	144	354	26	73	2,063	2,516
Total May 20, 1949	793	449	61	283	2,741,440	....	....	7	3	1	129	140	334	33	65	2,013	2,445

Service wells included: *3, †1.





DAILY AVERAGE PRODUCTION FOR WEEK

	May 20 crude oil	B. of M. May demand	May 13, crude oil
Alabama	1,750	1,900	1,700
Arkansas	78,800	86,000	79,100
California	858,500	845,000	856,750
Colorado	56,900	63,000	58,300
Eastern	61,700	60,800	61,100
Florida	675	1,100	1,050
Illinois	172,800	182,000	175,400
Indiana	29,200	27,000	27,900
Kansas	279,800	280,000	280,550
Kentucky	26,400	25,000	26,100
Louisiana	522,400	550,000	522,300
North Louisiana	121,200	.....	121,100
South Louisiana	401,200	.....	401,200
Michigan	47,600	45,000	46,800
Mississippi	103,400	102,000	101,450
Montana	23,800	25,000	22,100
Nebraska	1,500	2,200	1,400
New Mexico	126,125	139,000	126,125
Oklahoma	413,700	425,000	406,600
Texas	2,085,100	2,090,000	2,085,100
Dist. 1 (Southwest)	27,400	.....	27,400
Dist. 2 (Southwest)	121,850	.....	121,850
Dist. 4 (Southwest)	194,500	.....	194,500
Dist. 3 (Gulf Coast)	376,525	.....	376,525
Dist. 5 (Eastern)	31,525	.....	31,525
Dist. 6 (Eastern)	82,575	.....	82,575
East Texas field	262,000	.....	262,000
Dist. 7-C (West)	51,000	.....	51,000
Dist. 8 (West)	640,250	.....	640,250
Dist. 7-B (W. Central)	67,000	.....	67,000
Dist. 9 (N. Central)	139,000	.....	139,000
Dist. 10 (Panhandle)	91,475	.....	91,475
Utah	3,400	3,000	3,300
Wyoming	159,900	147,000	162,200
Total United States	*5,053,450	5,100,000	5,045,325
Change from previous week, up 8,125			
Canada	60,785	.....	62,745

Total U. S. production January 1-May 20 ..... †697,981,620 bbl.
Same period last year (crude plus cond.) ..... 734,632,995 bbl.

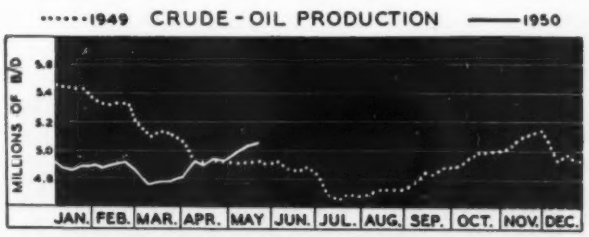
*Not incl. 104,530 bbl. condensate. †Incl. 13,407,345 bbl. condensate.

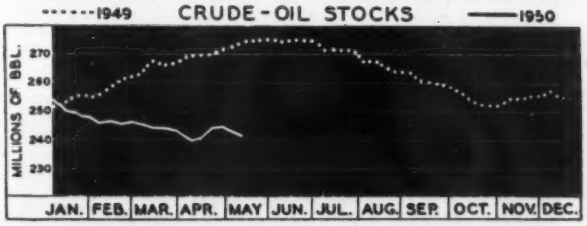
CRUDE-OIL STOCK BY STATES OF ORIGIN*

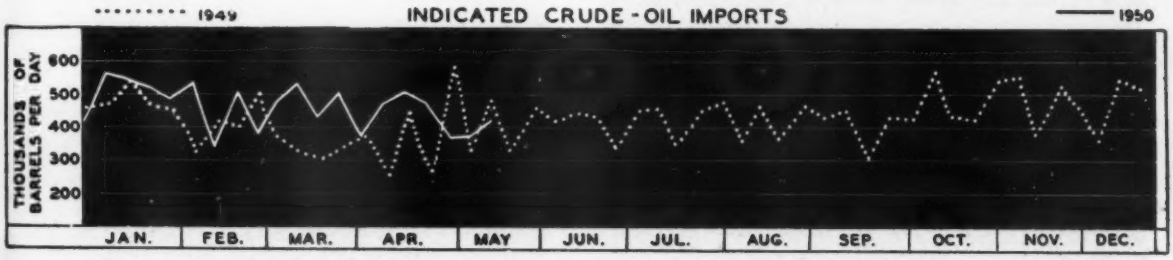
(Thousands of barrels)

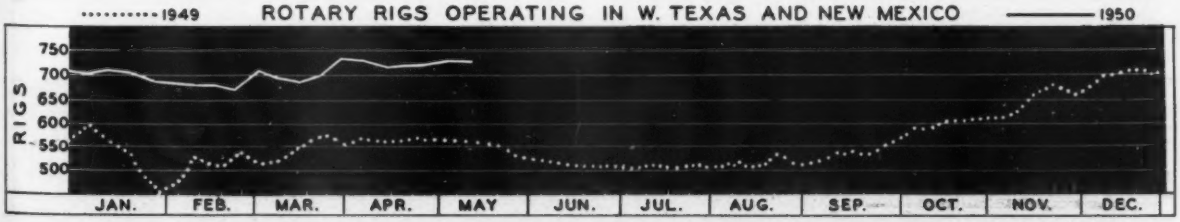
	May 13, 1950	May 6, 1950	May 14, 1949
Pennsylvania Grade	2,866	2,813	3,180
Other Appalachian	1,797	1,914	2,097
Illinois, Indiana, Michigan	8,857	9,145	14,527
Arkansas	2,908	2,876	3,001
Louisiana	15,151	14,564	13,830
North	3,346	3,189	3,172
Gulf	11,805	11,375	10,658
Mississippi	2,375	2,326	3,148
New Mexico	5,863	6,232	7,898
Oklahoma and Kansas	36,287	36,189	39,733
Texas	109,704	109,560	128,589
East Texas	14,797	15,023	17,805
West Texas	39,891	39,475	50,792
Texas Gulf	27,340	27,707	31,286
Other Texas	27,676	27,355	28,706
Rocky Mountain	13,239	13,304	13,358
California	36,520	36,952	35,492
Foreign	6,203	6,588	9,182
Total	241,770	242,463	274,035

*Bureau of Mines.









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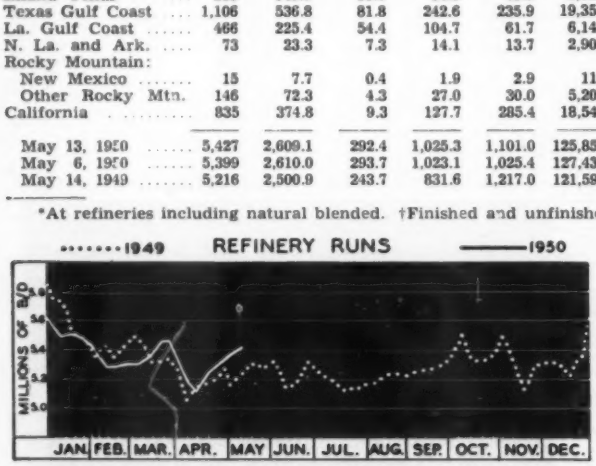
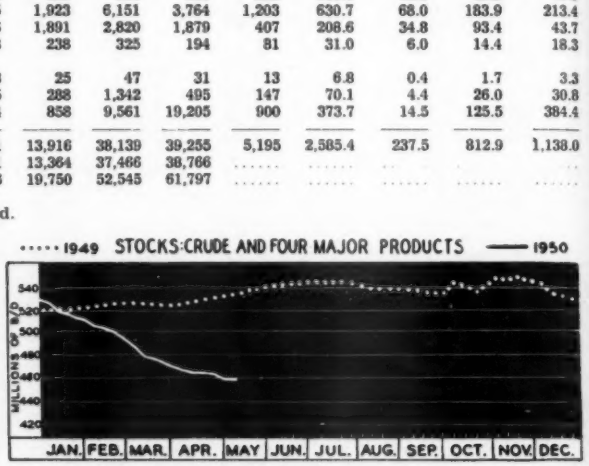
A.P.I. REFINERY REPORT, MAY 13

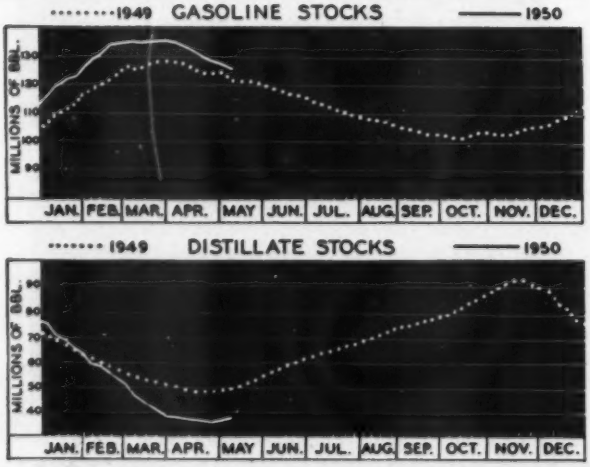
(Thousands of barrels)

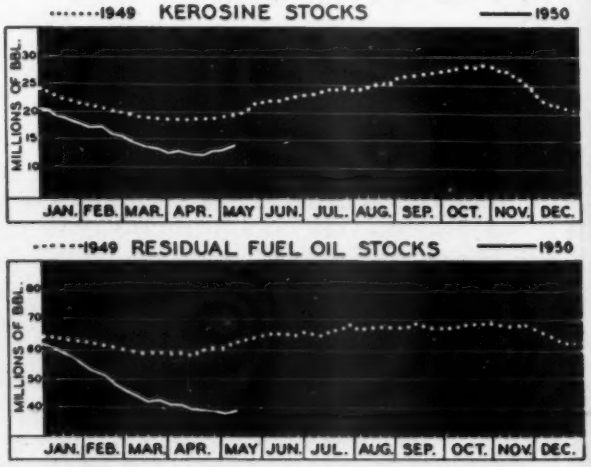
District—	Daily avg. crude runs	Daily average production				Stocks at refineries, bulk terminals, in transit and in pipe lines				Bureau of Mines, May 1949				
		Gasoline*	Kerosine	Distillate	Residual	Gasoline†	Kerosine	Distillate	Residual	Daily avg. crude runs	Daily average production: Gasoline*	Kerosine	Distillate	Residual
East Coast	910	359.7	30.1	202.0	199.4	26,143	5,220	9,191	9,365	751	317.7	21.3	145.7	172.0
Appalachian:														
District 1	102	41.6	6.0	11.0	11.4	2,596	296	438	286	90	40.2	3.5	8.6	10.5
District 2	72	35.7	4.3	9.0	14.4	938	78	116	107	58	31.6	2.1	4.1	10.7
Ind., Ill., Ky.	1,003	527.0	61.9	158.7	145.4	26,219	2,192	4,669	2,361	910	493.8	48.4	111.8	143.1
Okla., Kans., Mo.	481	258.9	22.0	92.4	59.2	13,997	638	2,674	879	413	226.0	22.1	78.6	60.8
Inland Texas	218	145.9	10.6	34.2	41.6	3,682	269	805	689	222	155.1	12.0	19.2	47.0
Texas Gulf Coast	1,106	536.8	81.8	242.6	235.9	19,355	1,923	6,151	3,764	1,203	630.7	68.0	183.9	213.4
La. Gulf Coast	466	225.4	54.4	104.7	61.7	6,146	1,891	2,820	1,879	407	208.6	34.8	93.4	43.7
N. La. and Ark.	73	23.3	7.3	14.1	13.7	2,908	238	325	194	81	31.0	6.0	14.4	18.3
Rocky Mountain:														
New Mexico	15	7.7	0.4	1.9	2.9	118	25	47	31	13	6.8	0.4	1.7	3.3
Other Rocky Mtn.	146	72.3	4.3	27.0	30.0	5,205	288	1,342	495	147	70.1	4.4	26.0	30.8
California	835	374.8	9.3	127.7	285.4	18,544	858	9,561	19,205	900	373.7	14.5	125.5	384.4
May 13, 1950	5,427	2,609.1	292.4	1,025.3	1,101.0	125,851	13,916	38,139	39,255	5,195	2,585.4	237.5	812.9	1,138.0
May 6, 1950	5,399	2,610.0	293.7	1,023.1	1,025.4	127,431	13,364	37,466	38,766	.....	.....	.....	.....	.....
May 14, 1949	5,216	2,500.9	243.7	831.6	1,217.0	121,596	19,750	52,545	61,797	.....	.....	.....	.....	.....

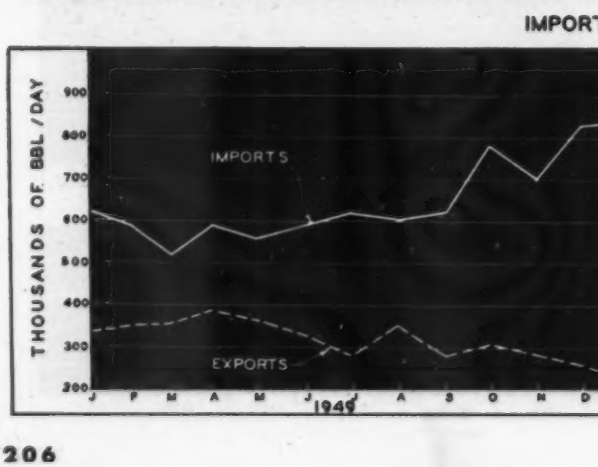
*At refineries including natural blended. †Finished and unfinished.

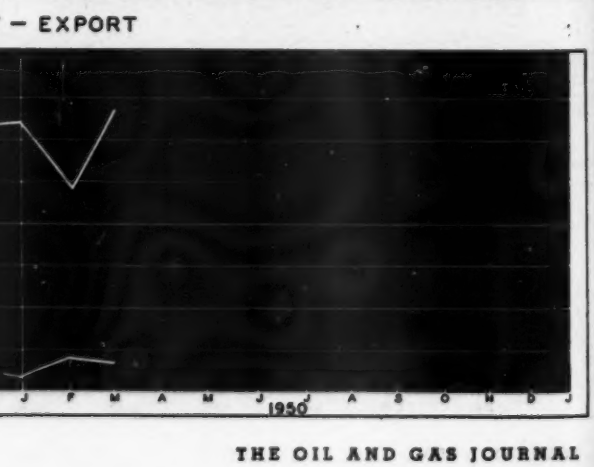


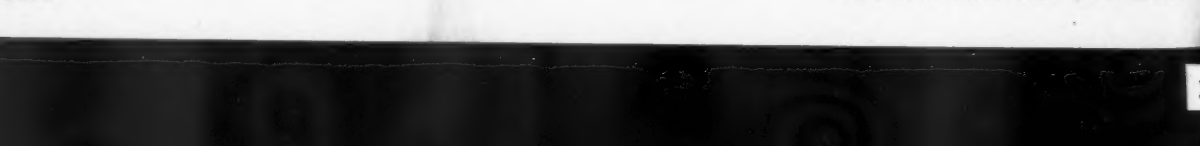












CRUDE PRICES

GRAVITY SCHEDULE

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.53			
19-19.9	1.63			
20-20.9	1.73	$2.25		$2.12
21-21.9	1.82	2.27		2.14
22-22.9	1.92	2.29		2.16
23-23.9	2.02	2.31		2.18
24-24.9	2.12	2.33	$2.56	2.20
25-25.9	2.22	2.35	2.58	2.22
26-26.9	2.31	2.37	2.60	2.24
27-27.9	2.37	2.39	2.62	2.26
28-28.9	2.42	2.41	2.64	2.28
29-29.9	2.48	2.43	2.66	2.30
30-30.9	2.54	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.64	2.49	2.72	2.36
33-33.9		2.51	2.74	2.38
34-34.9		2.53	2.76	2.40
35-35.9		2.55	2.78	2.42
36-36.9		2.57	2.80	2.44
37-37.9		2.59	2.82	2.46
38-38.9		2.61	2.84	2.48
39-39.9		2.63	2.86	2.50
40 and above		2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947. Above changes do not include recent reductions of a few buyers applying principally to low-gravity grades.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

East Texas†	$2.65
Kettleman Hills, California*	2.77
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	3.65
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

ESSO STANDARD OIL CO. announced increases in prices of kerosine and distillate fuel for most points in its marketing territory effective May 18. Barge price for kerosine in the New York Harbor area was raised .3 cent a gallon to 9.1 cents. No. 2 fuel advanced .4 cent to 8 cents. In the announcement, Esso called attention to the fact that kerosine and distillate stocks in the Gulf-East Coast areas were about 40 per cent lower than a year ago and that needed additions to storage during the summer months amount to about 270,000 bbl. daily for these areas.

The East Coast increase followed a decided firming in the Gulf Coast distillate market earlier in the week. This is the normal pattern on a rising market since a large part of the Gulf Coast surplus moves to the East Coast.

Esso had announced price protection for home owners covering purchases of distillate during the summer fillup period. In clarifying the provisions of this protection policy, the company stated that the period covered will be from June 1 to September 30.

High demands for residual fuel have extended the period of declining stocks by about a month compared with last year, and the low stock level is reflected in a very firm market. However, current prices are not very much below the level at which residual is competitive with coal and anything more than a moderate increase in price could cause some shifts to coal.

Grade 26-70 natural gasoline on the Group 3 market advanced another .25 cent per gallon to 5.125 cents or just .75 cent under the level for the early months of this year. Natural prices are moving up with the support of very high demands for motor fuel. For the 5 weeks ended May 13, refinery gasoline demand was greater than the peak of last summer.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of May 22, 1950. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	10-10¼	11.5-11.9	10¼-10¾
Premium gasoline, 86-88 octane	10¾-11¼	12.5-12.9	11-11½
42-44 w.w. kerosine	8½-8⅝	8.8-9.1	8-8½
No. 2 straw fuel oil	7⅝-7¾	7.6-8.0	6⅞-7¼
No. 6 residual	$1.60-1.70	$2.05	$1.65-1.80

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5⅛	4⅝	4⅞
Grade 18-55	6.15	5.65	5.9

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	10.5
750 vis., No. 3-4 neutral	12.75
2,000 No. 5-6 neutral	14-14.5

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	17-18
200 vis., No. 3 neutral, 0-10 pp.	11.5-12.5

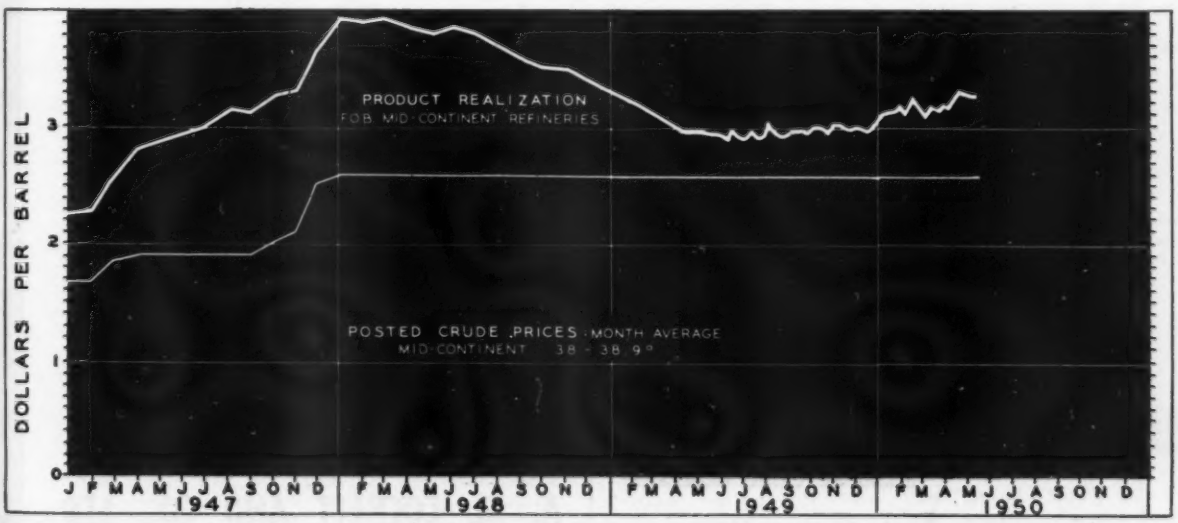
Western Pennsylvania

145-155 vis., 10 p.t. bright stock	20-20.5
180 vis., 0 p.t. neutral	21-21.5

WAX

Mid-Continent

132-134 A.M.P.	4.50


DOLLARS PER BARREL
PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
POSTED CRUDE PRICES - MONTH AVERAGE
MID-CONTINENT 38 - 38.9°
0
1
2
3
J F M A M J J A S O N D
1947
J F M A M J J A S O N D
1948
J F M A M J J A S O N D
1949
J F M A M J J A S O N D
1950

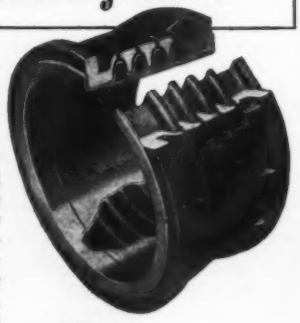
In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate, and fuel oil

XUM

Which hat do you wear when selecting an expansion joint?

Maintenance Engineer? . . .

. . . then you want to avoid "trouble-makers". You'll save work with Badger Joints because they respond to thrust quickly — eliminate wear and tear on adjacent equipment. No maintenance on the joints themselves either, thanks to single tube packless construction.

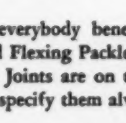


Metallurgist? . . .

. . . you'll be impressed by Badger's modern heat-treating and forming methods which eliminate structure-weakening stresses . . . guarantee long-life, greater flexibility.

Plant Designer? . . .

. . . space requirements are important to you. Badger Packless Corrugated Expansion Joints require no more space than ordinary flanged fittings.



Treasurer? . . .

. . . of course you're thinking in terms of costs. So you'll be glad to know that Badger Joints bring you all these extra features at no extra cost!

Send today for new 24-page catalog just off the press!

Yes, everybody benefits when Badger Directed Flexing Packless Corrugated Expansion Joints are on the job. So isn't it wise to specify them always?

Badger

MANUFACTURING COMPANY

230-260 BENT STREET

CAMBRIDGE 41, MASS.

SEALED FOR SAFETY!

The Davis No. 331S Field Regulator

SEALED against unauthorized resetting and against the erosion of weather, the Davis No. 331S spring-loaded Field Regulator gives real control on outdoor gas-gathering systems. Compact, rugged construction is similar to the well known Davis No. 330W weight-loaded Regulator. Built-in by-pass steadies valve action and prevents vibration. Can be adjusted for vacuum or back pressure service in the field. Get full details today. Write for Bulletin.

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2343 S. Washtenaw Ave., Chicago 8, Ill.

Distributor: Westcott & Greis, Tulsa, Dallas and Houston

DAVIS REGULATOR COMPANY

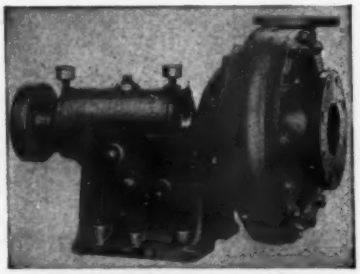
WORTHINGTON "WORTHITE"

SALT WATER PUMPS

For Longer Life and Dependability

WE OFFER

The Worthington Type "CG" all Worthite 20-24% Chrome Nickel Steel Centrifugal Pump for Electric Motor or Gasoline Engine Drive



Available for Stock shipment thru Our Distributors

A. M. LOCKETT AND CO., LTD.

HOUSTON NEW ORLEANS DALLAS

EQUIPMENT MEN ... in the News

Tube Turns Names Metal Goods as Distributor

Tube Turns, Inc., Louisville, manufacturers of welding fittings and flanges, has announced the appointment of Metal Goods Corp. as distributor of all of its products made in all alloys.

Metal Goods' home office is located in St. Louis, and the firm has distributing facilities in Kansas City, Dallas, Denver, Houston, New Orleans, and Tulsa.

Merrill Appointed to New Divisional Responsibility

H. MERRILL

Hamilton Merrill, vice president and director of Manning, Maxwell & Moore, Inc., has been appointed vice president in charge of the Consolidated-Ashcroft-Hancock Division, it has been reported by Robert R. Wason, president of the company, recently.

This division operates plants in Bridgeport and Stratford, Conn., Watertown, Mass., Jersey City, and Tulsa. Merrill is a graduate of Massachusetts Institute of Technology and has been with the company 30 years. He was elected vice president of the company in 1937 and a director in 1949.

Combustion Engineering Elects Ebdon, Ainsworth

H. G. Ebdon and William P. E. Ainsworth have been elected vice presidents of Combustion Engineering-Superheater, Inc., New York.

Ebdon joined the company in 1917 and since 1925 has served successively as manager of the proposition department; sales engineer, New York district office; and assistant general sales manager. In 1941 he was appointed general sales manager of boilers and related equipment. He will continue in the latter capacity, working in association with Donald S. Walker, the company's vice president and director of sales.

Ainsworth joined the company in 1921 as a service engineer and later became manager of the service and erection department. In 1939 he was appointed general purchasing agent and in 1942 was also made production manager. As a vice president he will continue in charge of purchasing and production for the company's six American manufacturing plants.

Harley Sales Opens New Wichita Branch

ROY O. NEAL

Roy O. Neal, president of Harley Sales Co., Tulsa, distributor for Wisconsin Motor Corp.'s air-cooled power units, has announced the opening of a new sales and service branch in Wichita, Kans.

The new outlet is headed by Russell A. Pride, who has had extensive experience in practical pump and engine applications in Eastern Texas and Kansas.

Harley Sales also operates a completely stocked service and supply unit in Houston, headed by George Kluppel.

Moyer Appointed Division Manager by Altens Foundry

C. W. MOYER

Warren M. Benson, vice president of Altens Foundry & Machine Works, Lancaster, Ohio, has announced the appointment of C. W. (Bill) Moyer as division manager, oil-field sales. Moyer, who has been special sales representative for the past 2 years, will henceforth direct all national sales of Alten equipment to supply stores and will assist Alten dealers with their merchandising activity.

Cunningham Awarded Technical Citation

James D. Cunningham, president, Republic Flow Meters Co., Chicago, has been awarded the 1950 merit award of the Chicago Technical Societies Council.

Cunningham, also president of the American Society of Mechanical Engineers, received the award for engineering, civic, and other achievements. It was presented by Dr. Gustav Egloff, research director of Universal Oil Products Co.

Silver Anniversary Marked By Barton Instruments

BARTON JONES

Barton Instrument Corp., now celebrating its silver anniversary, has announced plans to expand its activities to foreign fields by licensing European manufacturers to produce ruptureproof, bellows-type flow meters for overseas markets.

The original company, then known as Hansen, Jones & Morey, was founded 25 years ago to manufacture an air-operated transformer cooler. Later the company became Morey, Jones & Lovell, then Morey & Jones, Ltd., then Barton Instrument Co., and finally Barton Instrument Corp. Barton Jones, one of the three originators, is president of the corporation.

The firm started manufacturing primary flow meters early in its history. The earliest forms were mercury-filled manometer-type flow indicators. In 1932 it started a gradual change to bellows-type flow meters and in 1943 it produced its first liquid-filled dual-bellows meter.

This new type meter changed the character of Barton Instrument from essentially a manufacturer of custom-built instruments to producers of standardized meters.

Hake Joins Staff of Ketchum, MacLeod & Grove

William E. Hake, chemist and technical writer, has joined the technical literature department of Ketchum, MacLeod & Grove, Inc., Pittsburgh advertising and public relations agency. His work will be in preparation of technical literature, reference material, and sales literature.

Hake was formerly assistant supervisor of a coal gasification pilot plant at the U. S. Bureau of Mines Experimental station, Pittsburgh, under the sponsorship of the Southern Gas Co., Birmingham, Ala. From 1944 to 1947 he served as research assistant in synthetic-rubber manufacturing problems at Carnegie Institute of Technology, then carried on research in infrared spectroscopy for a time. From 1947 to August 1948, he was cihef chemist of Carbozite Protective Coatings, Inc., Greensburg, Pa.

(Continued on page 213)

XUM

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

CLASSIFIED ADVERTISING

UNDISPLAYED CLASSIFIED 12c a word one issue. 10% Discount three or more issues. $3.00 minimum charge. Blind Box in our care counts nine words. Payable in Advance.

DISPLAY CLASSIFIED
$12.00 a column inch one issue . . .
10% Discount three or more issues.

EQUIPMENT FOR SALE

ONE new 40′ x 40′ x 12′ corrugated aluminum building; double sliding door; single door and window; steel structure. Located: Bunkie, Louisiana. Anchor Gasoline Corp., Phone 54-5201, Tulsa, Oklahoma.

REBUILT BOILERS

85 HP. DONOVAN Oil Field Type Boiler, Complete with standard trim. Peerless Boiler Company, 421 North Cincinnati, Tulsa; 2015 NE Park Place, Oklahoma City.

BOILERS FOR SALE: 18 Code Oil Field Boilers, 50 to 87 H.P., 100 to 200 Lbs. W.P., Operated under Hartford into 1948, not fired since. Located on Leases vicinity Pampa, Texas. Offered subject to prior sale $500.00 to $700.00 Each, as is where is. Contact W. L. Godfrey or Max Harbison, Kewanee Oil Company, Pampa, Texas.

Several Army Surplus 4½″ x 6″ Gasoline Duplex 1860 Pumps — two piece skid mounted with Chrysler 8 cylinder engines. Will sell pumps only or complete units about half price.

H. H. COFFIELD
ATTN: W. H. Orr
Phones: 132—Rockdale, Texas
A-88064—Houston, Texas

FOR SALE OR LEASE

LOCOMOTIVES

2—100 ton 660 HP Baldwin diesel electric, four traction motors.
1—65 ton Whitcomb diesel electric new 1942, excellent condition.
1—50 ton Whitcomb 300 HP diesel electric, tractive effort 30,000#.
2—30 ton diesel operated switching locomotives new 1942, Full ICC.
1—50 ton Vulcan 0-6-0 side tank steam switcher, new 1942.
1—80 ton American 0-6-0 steam switcher, tender type, new 1942.
5—Type 2-8-4 steam road engines new 1940, finest condition.

LOCOMOTIVE CRANES

2—30 ton, diesel operated, new 1942.
3—40 ton, diesel operated, new 1942
2—25 ton American, steam, new 1942.
1—25 ton, Ohio, steam, new 1942.

CARS

50—all steel 70 ton capacity hopper.
25—Composite type box, 40 ton capacity.
19—all steel, 20 cu. yd. air dump cars.
Private Car — Completed January 1950.

SPECIAL!

36″ Gauge equipment—45 ton Whitcomb diesel electric locomotive, Baldwin 50 ton steam locomotive new 1930, Five 30 ton steam switchers, 34 Western 5 cu. yd. dump cars.
90″ Niles Wheel Lathe, new 1944.
110′ Turntable—fine condition.

Our stock includes many other locomotives, cars, cranes and heavy equipment items. We invite your inquiries.

WRITE — PHONE — WIRE

Pan-American Engineering Co.
P. O. Box 2576 Telephone L.D. 339
Dallas, Texas

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

COOPER Single Drum Winch Tractor, Model W-201-26, with 45-foot mast, A-1 condition. $2250.00. Rogers Pipe & Supply Co., Tulsa, Phone 3-2072.

1—45 STAR Spudder with motor and complete string of tools from 15½″ down to 6″. Will sell with tools or without tools. Harvey Creek, 3106 North Market, Wichita, Kansas. Phone 5-2855.

FOR SALE—127′ "Oilwell" Drilling Mast. 515,000 capacity, complete with six-foot substructure. Call or write H. Waggoner. Phone 64-1413, or P.O. Box 4657, Oklahoma City, Okla.

FOR SALE: Model L-107 Allis-Chalmers Fred E. Cooper winch unit for deep well servicing. Excellent condition. Priced to sell. Degen Pipe & Supply Co., Box 107, Red Fork Station, Tulsa, Oklahoma.

FOR SALE—NEW
ATTRACTIVELY PRICED

2—30″ Merco Lub. Plug Valves—200#—Fig. 1169
3—18″ Merco Lub. Plug Valves—150#—Fig. 1169
1—14″ Crane 475½—130# Gate—FF
1—14″ Chapman 600# Gate RTJ
12″ Daniel Orifice Fitting SA—651 w/600 RTJ FGS
8″ Daniel Orifice Fitting SA—169 w/150 RF FGS
(Both complete with meter runs)

Also $86,000 stock new plugs, valves, welding fittings and flanges at our Tulsa warehouse.

GREEN PIPE & SUPPLY CO.
Phone 2-8555, Tulsa, Okla. P.O. Box 1383

Reconditioned Seamless Tubing

O.D.	Wall thickness	Approx. lbs. per ft.
1 7/8	11 gauge	1¼
1⅞	11 gauge	1½
1½	11 gauge	2
2	11 gauge	2½
2¼	11 gauge	2¾
3¼	10 gauge	5
3½	9 gauge	5½
4	10 gauge	6½
5½	10 gauge	9

Over 20,000 feet of each size available in single or double random lengths, plain end, beveled for welding.

Write—Wire—Phone

SONKEN-GALAMBA CORPORATION
2nd and Riverview (X-595)
Kansas City 18, Kansas
THatcher 9243

EQUIPMENT FOR SALE

CULVER Vertical Furnaces for exfoliating Perlite $10,000 compared to $100,000 for old style, also purest of Perlite for sale. Particulars Box 2153-OJ, Denver, Colo.

BARGAIN

4—100 HP Superior Twin Gas Engine COMPRESSORS—now operating in Oklahoma. Alfred B. Kern, 223 Wright Bldg., Tulsa, Oklahoma.

FOR SALE: Two 2½″ x 1⅞″—One 3″ x 1½″—One 3″ x 1¾″—Two 4″ x 1¾″—Four 4″ x 2″ Conventional Type Kobe Production Pumps. These Pumps are in good condition, are ready to run. Peppers Refining Co., 2917 First National Bank Building, Oklahoma City, Okla.

CORE Drill Equipment for Sale: Two "Franks" truck mounted core drills, 2,000′ capacity; one shop built truck mounted core drill, 1,600′ capacity. All mounted on KR-11 International trucks. Four KB-7 International oil field trucks with jin poles and model 34 Tulsa winches. Four pole trailers with bolsters, three of them equipped with dollies for holding pipe loads. Approximately 2,500′ used 2⅜″ x 20′ drill pipe with 3⅜″ tool joints. Contact Mr. K. J. Reid or Mr. W. H. Hawkes, P.O. Box 1654, Oklahoma City. Telephone 2-6381.

FOR SALE—BARGAIN

Large Steam Rig #23 Ideal Hoist 48″ Hyd Brake, 4-350 Boilers, 14x14 Engine, 18″ & 20″ WS Pumps, 10x9 Oil Well Vertical Engine, 136′ Drk., Substructures, 10,000′ 4½ Drill Pipe, All 300 Ton Up & Down Eq. Rig Complete Ready to Go, Located at Odessa, Texas. For Particulars Call or Write:

McDANIEL & BEECHERL DRLG. CO.
520 Rep. Bk. Bldg., Dallas, Texas, or Phone 3651, Odessa, Texas.

For Sale at a Bargain

9520′—1¼″ External upset tubing.
14—GOT Type "G-JR" Pressure Controlled Valve w/ 2 6/64″ Ports
10—GOT Type "G-JR" Pressure Controlled Valves w/ 2 7/8″ Ports
24—GOT Type "G-JR" 1¼″ Mandrels
1—GOT Type "A-1" Surface Controller Serial #498
1—Fisher Controller, Type 4367F, Serial #837391
1—1¼″ Tubing Hanger
1—GOT Type "O-JR" Pressure Controlled Valve, Serial #183-800#
1—B. M. W. Anchor, 1¼″ for 2½″ Tubing
1—GOT Type "O-JR" Reverse Check
1—GOT Type "O-JR" 1¼″ Mandrel

ALL TO BE SOLD TOGETHER

All equipment new when run in and out of hole. Can be inspected at our warehouse at Cyril, Oklahoma.

The Palmer Oil Corp.
Wichita, Kansas

EQUIPMENT FOR SALE

FOR SALE in West Texas: One Model 61 Wichita Spudder with Le Roi drilling engine, big hole tools, shear pole mast and all auxiliary equipment. Rig is mounted on steel skids. Box D-492, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 1—1944 Model LMSWM Mack Tandem with NH-600 Cummins Diesel engine, Brown Lipe with Power Tower, 11:00 x 24 rear tires, 14:00 x 24 front tires, Garrison power steering, heavy duty oil field bed and winch, has gin pole lifts. Good Condition. Commercial Truck Company, 713 Texas Avenue, Lubbock, Texas. Phone 4350.

COMPRESSOR CYLINDERS & COMPRESSORS—All Sizes

6" to 26" by 20" Stroke Bessemers—Coopers—Clarks.
10" x 4¼" x 10" XOB Ing. Rand.
8" x 8" XRB Ingersoll-Rand.

W. S. SMITH
205 Thompson Bldg. Phone 2-5473
Tulsa, Oklahoma

FOR SALE
NEW SEAMLESS CASING

3,350' 10⅝ Joints 5½" OD 17# Range 2 J-55 Long Collars, FOB Pittsburgh District.
4,836.9' 5½" OD 17# J-55 Range 2, FOB Irvine, Kentucky.
6,300' 7" OD 17# H-40 Range 2, FOB Magnolia, Ark.
5,800' 7" OD 17# H-40 Range 2, FOB Westen, W. Va.
2,825' 6" 88 Joints 7" OD 20# H-40 Range 2, FOB Lansing, Michigan.
The above material is available for spot delivery and is necessarily offered subject to prior sale.

Other Sizes Line Pipe and Tubing Available . . . For Prices Contact

A. J. STRUBEL
Sidney 1791
5060 Pernod, St. Louis, Mo.

EQUIPMENT

100 OCTANE REFINERY

Cotton Valley, La.

5—Upshot heaters — U.O.P. type Vogt—Kellog—G-R exchangers & condensers. Fractionating columns. Drums and pressure vessels.

I-R—B-J—National Transit—Union — Hills-McCanna—Worthington centrifugal, reciprocating, steam, turbine and motor driven pumps.

SEND FOR
COMPLETE LISTINGS

DULIEN STEEL PRODUCTS, INC.
of Washington
P. O. BOX 667
COTTON VALLEY, LA.
PHONE: COTTON VALLEY 26

EQUIPMENT FOR SALE

USED ROTARY AND CABLE TOOL DRILLING TOOLS, WIRE LINES. E. A. KELLY, BOX 861, OKLAHOMA CITY. PHONE 5-6407.

FOR SALE: 1—36-L Bucyrus Rig, 1948 model, complete with all tools. Phone 2032. Henderson, Kentucky.

FOR SALE: Super Model Wilson skid winch, powered with 6-MZR Waukesha engine. Priced less than 50% of new cost. Melton Supply Company, Box #1360, Seminole, Oklahoma.

FOR SALE: Pipeline Equipment: TD-18 International Tractor with Isaacson angledozer. Cleveland Trencher Model 140-A Diesel Power. Two D-4 Caterpillar Tractors with Trackson Sidebooms, one with angledozer. 300 Amp. Lincoln Welder. Heco Pipe Cleaning Machine. 10 Barrel Tar Pot on wheels. Pole trailer. This equipment completely reconditioned, painted and first-class condition. Attractive price if taken in one lot. F. B. Anderson, Inc., 809 Interstate Trust Bldg., Denver, Colorado. Phone Alpine 5933.

FOR SALE—Several used Mayhew 1000 and 600 rotary type drills, mounted on 2-ton Chevrolet trucks. Many in operation at present. Inquire at 8800 Lemmon Ave., Dallas 9, Texas. Phone Dixon 4-2671.

PIPE LINE PUMPS

2 Snow steam pumping units, 26" x 44" x 6" x 36", duplex plunger types.
1 National Transit 10" x 18" suction pump.

Priced to Sell

C. J. SMITH
433 Mayo Bldg. Phone 5-3416
Tulsa, Oklahoma

COMPLETE PORTABLE DRILLING UNIT

1—K-11 I.H.C. Drill Truck with Failing #55 Drill equipped with 54 Ft. mast, complete with all tools.

1—KB-10 I.H.C. Pump Truck with 1 5" x 10" Wheatley Pump & 1—5" x 6" Gardner-Denver Pump mounted on truck. Pumps are equipped for slush service.

1—4-Wheel Trailer with Tool House mounted on Trailer.

3,000 Ft. 2⅞" OD Drill Pipe with 4⅛" OD Tool Joints.

1—KS-8 I.H.C. Water Truck with 1,000 gallon tank.

All of the above equipment is complete, in excellent condition, and ready to drill; located in Tulsa, Oklahoma.

Contact

W. B. KENDALL
2607 No. Boston Pl.
Tulsa, Oklahoma, Telephone 3-6251.

PIPELINE EQUIPMENT

Caterpillar D8, 2U Series with LaPlante Choate Hydraulic Angledozer and LeTourneau DDPCU in the rear.
Caterpillar D2 Trackson front end loader.
Caterpillar D6 with new LaPlante Choate Hydraulic Angledozer and Hyster towing Winch in the rear.
Garwood Scrapers, Model 525.
P & H ¾ yd. Truck Crane.
Schield Bantam Truck Mounted Backhoe.
Scoopmobiles with Hydraulic Angledozer and scoop.
Allis-Chalmers road maintainers.
International K-11 Tractor with special Bed for pipe.
Cleveland 95 Trencher.
Cleveland 110 Trencher.
Cleveland 140 Trencher.
Buckeye 312.

The Chas. M. Ingersoll Co.

Rocky River 16, Ohio
19930 Detroit Rd. Ph.: EDison 1-1010

EQUIPMENT FOR SALE

WAR SURPLUS MACHINERY

Gaso, Byron Jackson, Aurora, Wayne, Lombard, & Hale Fire Pumps with Engines, 1½ to 25 KW Generator Sets or Light Plants, Engines, Suction Hose, Fire Hose, Victaulic Couplings & Etc. Write for listing. H. A. McCarthy, 310 Thompson Bldg., Phone 5-3296, Tulsa, Oklahoma.

FOR SALE: One 7¼ x 14 Whelan model 11000 Slush pump. New fluid end, gear box A-1. Melton Supply Company, Box 1360, Seminole, Oklahoma.

FOR SALE
(SUBJECT TO PRIOR SALE)

3 Bolted tanks, 2 in original crates and one assembled, (100 Bbl.). 69'-14" 57# Drive Pipe; 170'-10¾" 41# Drive Pipe; 407'-10¾" 32.75# Casing 8Rd. Thd. Smls.; 3045'-8" 24# Casing 8Rd. Thd. Smls.; 6286'-7" 23# Casing 8Rd. Thd. Smls.; 8101'-3" 9.20# Tubing Smls.; 1453'-2½" Tubing EUE Smls.; 14,226'-3" 6.40# Regular 10Rd. Thd.; 375'-⅞" Pumping rods; 9-5" Orbit Gate Valves; 9-3" Orbit Gate Valves; 3-2" Orbit Gate Valves; 3-2⅞" x 6" Parmco Combination Packer; 1-2⅞" x 6" Larkin Screw Trip Packer; 1-3" x 6" Parmco Packer; 1-2⅞" x 6" Gas Anchor Packer. M. B. Belden Office at 425 2nd St. N. W., Canton 2, Ohio, Phone 4-6147.

FOR SALE: One, type-100 National Drilling Rig has drilled only two wells. With 800,000 pounds capacity jack-knife derrick. Box D-448, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 1—Wilson Mogul double drum cable tool rig powered with Waukesha engine. Has cable tool and rotary drilling attachments. Rig in good workable condition. P.O. Box 128, Overton, Texas. Phone 32F1.

1 COMPLETE String of Rotary Drilling Tools: Ideal Drawworks, Wheland Clutch, 7¼ x 14 New Type Wheland Pump, Waukesha Motors, 3600' 4½" Drill Pipe, 122' Lee C. Moore Champion Rotary Derrick, Tool House and all necessary equipment goes with this rig. Anyone interested either write H. M. Williams Drilling Company, 701 Bitting Building, Wichita, Kansas, or telephone 48542.

FOR SALE: One Gumbo Buster 26" Oil Bath rotary table in good running condition. Attractive price. Melton Supply Company, Box 1360, Semniole, Oklahoma.

FOR SALE: Portable deep well servicing rig. Cardwell model H, code HSMZS, serial No. HS-951, single drum hoist with 8" x 7" telescoping mast. Powered with 6MZ Waukesha with gas-gasoline carb., regulators and volume tank. Unit is mounted on 1946 model 25 VBS 5 ton Reo truck. This equipment in good shape and has had very little use. $8750.00. Marena Oil Co. Box 720, Cut Bank, Montana.

FOR SALE: 36-L Bucyrus Erie complete with tools. Well Driller, 1625 Court Manor, Owensboro, Ky. Phone 3-6651.

FOR SALE: Boilers, Tanks & Pumps. 15 new vertical 500 bbl. bolted tanks, crated. 4 used 100,000 gal. 9/16" plate. 4—67,500 gal. ½" plate. 2 new Deming Deep Well Pumps with Sheppard Diesel, 100 gpm @ 100' head with casing and spare parts. 1—100 H.P. Farrar & Trefts Locomotive Boiler 300# w.p. with stack and grates. H. Loeb & Son, 4643 Lancaster Ave., Philadelphia 31, Pa.

FOR SALE: Wilson Mogul drilling rig with portable derrick complete. Suitable for 4500' depth. Now running in Bebee Field, Pontotoc County, Oklahoma. Contracts available. Lake Oil Company, Ada, Oklahoma.

FOR SALE: At Okla. City Warehouse, 1—Allis-Chalmers model UM-4 Skid Type Well Servicing Winch, No Mast—Cities Service—Patridge—Bartlesville, Oklahoma.

1—Shot Hole Drill Truck, Chassis WHAX 1947 Dodge, Mayhew Drilling Unit—Model 600 Complete w/ Gardner-Denver 4½x5 mud pump. Mast 19 feet—Kelly 12½ feet. 100 feet 2⅜" Used Drill Rod. 3—Dodge Water Trucks: 2 Ton Chassis WHAX—2 Ton, 400 Gallon Tank, Tulsa 18—Winch. 1—Model DDH—Oliver Cletrac Tractor w/ Hercules 6 cylinder Diesel Engine, Electric Starter and battery ignition complete with southwest cable controlled trailbuilder and Buckeye Double Drum Power Control Unit. If interested, write or call The Atlantic Refining Company, c/o Mr. V. H. Gray, P. O. Box 2819, Dallas, Texas, Telephone P7-6484, Station 8-273, Dallas.

EQUIPMENT FOR SALE

FOR SALE: 3500′ capacity rotary, truck mounted, 55′ mast, 5 x 10 G-D pump. Or will contract for cash and interest. Reply Box D-515, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE at our Lacy Plant, Seminole Field, 3—10′ x 40′ Horizontal Welded and Riveted Gasoline Storage Tanks. Cities Service Oil Co., Patridge, Bartlesville, Oklahoma.

4,000′ 4½″ Drill Pipe, Good Tool Joints. Reasonable. Box 4154, Tulsa, Oklahoma.

FOR SALE: New 1¼″ Improved plow steel wire lines 6 x 19 R L Hemp Core. One Spool 3500′ at 28c per ft. Four Spools 1800′ at 24c per ft. Thirty Spools 600′ at 20c per ft. FOB Okla. City, Okla. General Tool & Supply Co. P.O. Box 4387—1319 S.E. 29th. St., Okla. City, Okla.

EQUIPMENT WANTED

INTERESTED in small portable double-mast rig, capable of drilling to approximately 2000 feet, with or without drill pipe. Equipment must be in good condition and reasonably priced. Preferably located in Southwest Texas. Contact:

MAKIN DRILLING COMPANY

Box 131, Hobbs, New Mexico, Phone 131

HELP WANTED

FOREIGN and Domestic Oil Employment Directory (including late supplement of oil companies and drilling contractors in Western Canada). Over 500 listings in drilling, production, refinery, natural gasoline, pipelines, geological, exploration, supplies, manufacturers, services and refinery and pipeline contractors, showing where to apply for jobs. Price $5.00. Oil Industry Mailing List, Box 2603, Tulsa, Okla. (Our 30th year)

ENGINEERS, Executives, Technical Men. Salaried positions—$3600 to $30,000. This confidential service for outstanding men who desire a change of connection, will develop and conduct preliminary negotiations without risk to present position. Send name and address for details. Tomsett Associates, 1204 Berger Bldg., Pittsburgh 19, Pa.

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Tulsa, Oklahoma

GAS ENGINEER WANTED

By consulting engineering firm located in New York City. Applicant should have had experience with either transmission or distribution of natural gas. Analytical ability desired in connection with certificate and rate work. Age 35-45. Reply giving age, education, experience, references and salary required. All replies kept confidential. Write Box D-487, The Oil & Gas Journal, Tulsa, Oklahoma.

WANTED—ASPHALT CHEMIST

Not over 30 years of age for position with well-known national manufacturer. Must be thoroughly familiar with various asphalt formulations, particularly emulsions. Wonderful opportunity for an energetic and imaginative individual. State age, experience and education and include photograph in first letter. Box D-505, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

PARTY CHIEF-SUPERVISORS for South America. Must have several years experience gravity exploration. Expenses, salary commensurate to experience. Only qualified personnel apply, Exploration Surveys, Inc., 5615 Daniels Avenue, Dallas, Texas.

WANTED: YOUNG PETROLEUM ENGINEER. Chemical Engineering graduate, familiar with petroleum refining processes and equipment—for career training as specialized insurance adjuster by large midwest organization. Prefer man under thirty years of age and several years experience with major oil company. Reply giving education, details of personal and employment history, present salary and reasons for wanting occupational change. Responses will be treated confidential. Reply Box D-506, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED: Process Engineer, prefer one with five years or more experience. Southwest Refinery, Box D-497, The Oil and Gas Journal, Tulsa, Oklahoma.

EVALUATION ENGINEER—A progressive and substantial Mid-Continent oil company desires the services of a fully qualified oil property evaluation and/or appraisal engineer. State age of applicant, scholastic training, former affiliations, years and record of experience, present assignment, date of availability, and expectant salary. All applications will be held confidential. Address all inquiries: Box D-486, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: COMBINATION Petroleum Engineer and Geologist for vice president and executive of well-established independent oil company located in Dallas. Must be man of unquestionable integrity. Must have extensive geological knowledge of West Texas area and wide experience in drilling and production practices. Salary open and investment privileges. State salary expected. Replies strictly confidential. Box D-499, The Oil and Gas Journal, Tulsa, Oklahoma.

LARGE responsible organization is establishing a petroleum and natural gas statistical division and desires the services of a Canadian resident geological engineer with educational qualifications and at least two/three years' practical experience. Good opportunity for right individual. Applications should be by letter to the undernoted box number, accompanied by photograph, and should include qualifications, references and state present salary if employed and, if not, last salary. Box D-513, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

TECHNICAL SALES ENGINEER: Five years experience in selling heat exchangers and bubble columns to oil and chemical plants on the West Coast. Have wide acquaintance with refining engineers. Want to represent a manufacturing concern, or will consider handling various lines of equipment related to oil and chemical plants. Age 32. B.S. in petroleum and mechanical engineering. Married, two children. Prefer work West of Rocky Mountains. Not afraid to work hard on a sales job with a good future. Reply to Box D-495, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION CONTRACTORS—Construction Superintendents: You have good engineers, draughtmen, material procurement men, but they are human and therefore make errors. These errors cost you in time and money. You need a pipe man in the field that can catch these errors at an early stage. You need a pipe man that can handle your piping installations from breakground to on-stream. You need a pipe man with your interest at heart. You need those contracts and I need a connection with a good firm. Jim O'Connor, 1300 Orleans, Beaumont, Texas.

GEOLOGIST with Major Company experience desires connection with Independent concern. Box D-514, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT—TAX SPECIALIST

Administrative accountant, thoroughly responsible federal, state tax man. Age 40. Former public accounting experience in oil and gas, now specialist for national manufacturer. Capable correspondent, well versed in public and employe relations. Want several duties in moderate size concern. Box D-511, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PRODUCTION MANAGER-SUPERINTENDENT. 10 years' supervisory experience development and production in Mid-Continent and Rocky Mountains. Capable complete responsibility for drilling and production programs. Graduate Engineer. Age 36. Desire responsible connection with active organization. Now employed responsible position. Change desired due curtailment employer's activities. Record and details on request. Box D-512, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER - TECHNOLOGIST. B.S. Ch. E. 5 years diversified experience, 3 years refinery design, development, trouble shooting. Seeking career opportunity. Top references, available promptly. Age 28, family. Box D-485, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 131, Ph. No. 131, Hobbs, New Mexico.

PETROLEUM Chemist-technologist, Ph.D. Family. Chief Chemist or Assistant Superintendent. 15 years' experience laboratory management, products control, research, development and technical service. Available soon. Box D-510, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION and Drilling Supervisor desires position with small company, 25 years' experience. Age now 43. Now employed. Write for interview. Box D-508, The Oil and Gas Journal, Tulsa, Okla.

ACCOUNTANT-AUDITOR, CPA, Fifteen years diversified accounting and tax experience, principally in Oil Industry. Available immediately. Box D-488, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

480. Lincoln County. Structurally right by Prominent Geologist. Will contribute $6,500 dry hole money. Prue, Hunton, Viola. Maps, information available. Don't answer unless you mean business. D-507, The Oil and Gas Journal, Tulsa, Oklahoma.

OFFERING 32000 10 yr. oil and gas fee leases at $1.25 per acre in Western Nebraska County where oil play is hot right now. Box 2181, Denver, Colo.

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Suite 200, Grand Pacific Hotel
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(Member National Oil Scouts and Landmen Association. References exchanged).

LEASE AND DRILLING BLOCKS

SIX WYOMING STRUCTURES available for immediate drilling. Good surface geology. Are widely separated and all are near production. Costs, depths and royalties are reasonable. More than 20,000 acres total. Drilling and other supervision if desired. Box D-509, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Limited number oil and gas leases in NW Beaver County, Oklahoma, Township 6, Range 20. Contact: W. A. Franks, Route 1, Liberal, Kansas.

HAVE two thousand acres prospective oil land, near present production, good geology. Also good agricultural and grazing. Will sell half undivided interest and join purchaser in mutual development. Experience and reference requested. Box D-489, The Oil and Gas Journal, Tulsa, Oklahoma.

OFFERING 30,000 acres leases Valencia County, N. Mex., 10,000 Hidalgo County, 6,000 Torrance County, $1.50 acre—17,000 acres Wallace County, Kansas, $1. Write if interested, Box 2153, Denver, Colo.

OIL LEASES, drilling blocks, near test wells to be drilled, in Morgan and Macoupin Counties. Gas wells, and oil at 400 feet; One log shows five shows of oil to 1790 feet. S. J. Burkitt, Moweaqua, Illinois.

WILDCAT SHALLOW prospect in Brown County. Plenty of dope. Your personal inspection necessary to make deal. W. H. Mahon, P. O. Box 821, Brownwood, Texas.

800 ACRE five year oil and gas lease one mile from Texas Co. discovery well Rosebud County Mont. Attractive deal open to parties interested in financing drilling well. Second well now being drilled ¾ mile from lease. R. K. Ferguson, 1104 First Street East, Roundup, Montana.

FOR SALE: One Proven Scurry County Offset Lease. Should prove to be two year payout. Navarro Royalties Company. Telephones: 6439 and 9471, Odessa, Texas.

IF you've got real oil proposition or royalty that you wish to sell, or any defaulted municipal or special assessment bonds, bring your deal to me. Dyer-OJ, 1835 Champa, Denver, Colorado.

FOR SALE: Oil and Gas Leases and drilling propositions in shallow territory of Allen, Simpson, and Warren Counties, Kentucky, W. P. Harley, Bowling Green, Kentucky.

REAL ESTATE

FOR SALE: 8000 sq. ft. new, one-story building with extra storage ground, truck docks and railroad switch available, Larned, Kansas. Suitable for oil well supply or business serving oil business. Immediate possession. Easy terms. McNaghten Investment Company, Hutchinson, Kansas.

FOR SALE—MAPS

UP-TO-DATE two tone oil and gas Map of Texas on 38" wall mounting spring roller. Shows all Oil and Gas fields in Orange Color up to March 1, 1950. Geophysical prospects are also shown in black in a few important counties. Price $10.00. Ultra-Geophysical Service Company, P. O. Box 1231, Fort Worth, Texas.

PATENT ATTORNEYS

PATENT Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommell Registered Patent Attorneys, Suite 418 815-15th Street, N.W., Washington 5, D. C

PERSONAL

ANYONE KNOWING WHEREABOUTS OF

R. L. CALKINS

who owns royalties in Wayne County, Illinois, please get in touch with Skiles Oil Corp., Mt. Carmel, Illinois.

ROYALTIES

DEEDED ROYALTIES
San Juan Basin & Permian Basin. Write Harry S. Wright, Wright Bldg., Farmington New Mexico.

MONTANA ROYALTIES
Millions of acres now leased by world's major companies, with huge drilling play in prospect. For booklet describing Montana geology and oil development, write Landowners Royalty Company, Box 1225 Great Falls, Montana.

WE will buy producing or non-producing oil royalties. Standard Security Company, 115 Broadway, New York 6.

BUSINESS OPPORTUNITIES

WANT about $5,000 for small refinery deal in Montana. Abnormal returns from investment. Details — Box 2181, Denver, Colo.

I AM READY with rigs, some casing, ten year paid up leases, proven and wildcat. Need financial partner for increasing action. Write experienced operator, geologist. Post Office Box 2323, San Antonio, Texas.

FOR SALE: Complete oil well cementing equipment and business. Owner retiring due to poor health. Box D-504, The Oil and Gas Journal, Tulsa, Oklahoma.

LEGAL BLANKS

BURKHART LEGAL BLANKS since 1908 Oil-Gas (all states), Business, Real Estate, Legal Forms, Leases, Revised With Government Regulations, Commercial Printing, Catalog and Samples on request. Burkhart Printing & Stationery Company, 115 South Cincinnati, Tulsa 3, Oklahoma.

WANTED

WANTED: SURPLUS Chemicals, Oils, Waxes, Solvents, Wastes and Residues of all kinds. Chemical Service Corporation, 98-06 Beaver St., New York 5, N. Y.

WANTED: Partner for Shallow Well Drilling Rig capable of 3,000 feet. Partner must have some capital. Must be capable of making contacts and supervise drilling operations. Rig located in South Texas. Reply to P. O. Box 127, Falfurrias, Texas.

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FOR lease or rent 3030 square feet attractive office space in Frates Building, Odessa, Texas. Modern, air-conditioned and parking space. On lease basis, will arrange floor space to suit tenant. C. L. Frates, 1101 First National Building, Phone 2-6301, Oklahoma City, Oklahoma.

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LET us help you locate your oil wells. Our scientifically instrumentation survey will show you where there is oil, outline complete pools, number of pays, etc. Most positive results; let us prove it to you. Don't waste your money on dry holes. Our services are reasonable. Breuer Bros., Sheridan, Ill.

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BUILT TO ORDER
FOR PRICES, SPECIFICATIONS, ETC. WRITE:
FRED R. HOLLAND
Fort Worth Club Bldg., Fort Worth, Tex.

LEGAL

360 ACRES of allotted Indian lands located in Township 2 south, Range 1 east, in the Uintah and Ouray Reservation are being advertised for lease, bids on which will be opened June 1, 1950, at 2:00 p.m. at the office of Forrest R. Stone, Superintendent, Uintah and Ouray Agency, Fort Duchesne, Utah. Full particulars may be obtained from Superintendent Stone or from Mr. J. R. Schwabrow, U. S. Geological Survey, Federal Building, Casper, Wyoming.

EQUIPMENT MEN

(Continued from page 209)

Lemen Conducts Italians On Oil-Installations Tour

W. E. LEMEN

W. E. Lemen, Tulsa representative of J. F. Pritchard & Co., process plant design and construction engineers of Kansas City, Mo., was visited recently by Dr. Piero Verani - Borgucci, technical director of Azienda Generale Italiana Petroli of Rome, Italy, and his associates Prof. Giorgi Roberti, consulting chemist, and Dr. Cesare Gavotti di Castellano, petroleum engineer.

These men are visiting oil-field installations in the United States, specially natural-gasoline plants, for the purpose of determining the equipment most suited for the expansion program which the company has planned for further development of its oil properties in the upper Po River Valley in Italy.

Azienda Generale Italiana Petroli (A.G.I.P.) is discussing with J. F. Pritchard & Co., as well as other engineering firms, plans for the construction of a $2,500,000 natural-gasoline plant to be erected in Cortemaggiori field, 50 miles southeast of Milan. Lemen took the visitors on a tour of the most important Oklahoma oil fields and natural-gasoline plants.

Floyd Named Executive Vice President of A. O. Smith

J. M. FLOYD

J. M. Floyd, who has been vice president in charge of manufacturing for the A. O. Smith Corp., has been named executive vice president of the company by action of the board of directors, it has been announced by W. C. Heath, company president.

Floyd in his new position will take over general operating supervision of the company under the general direction of the president. He has been in charge of manufacturing since he came to A. O. Smith in 1936 from Bendix Aviation Corp. There he had been works manager of that company's Bendix products division.

In addition to his new position, Floyd is a member of the board of directors and of the executive committee of A. O. Smith, and holds the position of vice president of A. O. Smith Corp. of Texas.

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CALENDAR

May

American Institute of Chemical Engineers, regional meeting, New Ocean House, Swampscott, Mass., May 28-31.

Gas Technology Short Course, Texas College of Arts and Industries, Kingsville, Tex., May 29-31.

June

National Oil Scouts and Landmen's Association, Skirvin Tower Hotel, Oklahoma City, June 8-10.

American Society of Mechanical Engineers, oil and gas power division, Lord Baltimore Hotel, Baltimore, June 12-16.

Pennsylvania Grade Crude Oil Association, Hotel William Penn, Pittsburgh, Pa., June 15-16.

American Society of Mechanical Engineers, Hotel Statler, St. Louis, June 19-23.

Canadian Gas Association, annual convention, Manoir Richelieu Hotel, Murray Bay, Quebec, June 19-24.

Kentucky Oil and Gas Association, annual meeting, Lexington, Ky., June 22-23.

Petroleum Equipment Suppliers Association, annual membership meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., June 25-27.

American Society for Testing Materials annual meeting Chalfonte-Haddon Hall, Atlantic City, N. J., June 26-30.

American Petroleum Institute, midyear division of production and standardization conference, Brown Palace Hotel, Denver, June 26-30.

July

Institute of Petroleum, oil shale and cannel coal conference, Glasgow, Scotland, July 3-7.

Pacific Coast Gas Association, annual convention, Seattle, Wash., July 31-August 3.

August

Interstate Oil Compact Commission, summer meeting, French Lick, Ind., August 3-5.

September

National Chemical Exposition, Chicago Coliseum, Chicago, September 5-9.

American Society of Mechanical Engineers and Instrument Society of America, Municipal Auditorium, Buffalo, N. Y., September 11-15.

National Petroleum Association, Hotel Traymore, Atlantic City, N. J., September 13-15.

Instrument Society of America, annual instrument conference and exhibit, Memorial Auditorium, Buffalo, N. Y., September 18-22.

American Society of Mechanical Engineers, petroleum mechanical engineering conference, Roosevelt Hotel, New Orleans, September 25-27.

NOMADS

Tulsa Nomads, third Friday of each month. After Five Room, Tulsa Hotel.

Dallas-Fort Worth Nomads, first Monday of each month, Greater Dallas Club.

Houston Nomads, second Monday of each month. Ye Ole College Inn, Houston.

Los Angeles Nomads, second Wednesday of each month, Jonathan Club.

New York Nomads: June 27, golf party, Ardsley (N. Y.) Country Club.

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